# The Communicator

A Publication Of The Surrey Amateur Radio Club

SARC

February 2018

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The **Communicator** is a publication of the Surrey Amateur Radio Club. It appears monthly, except July and August, for area Amateur Radio operators, to enhance the exchange of information and to promote local ham radio activity.

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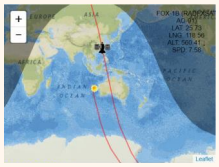
SARC maintains a website at **www.ve7sar.net** and a Digital Communicator at **ve7sar.blogspot.ca** that includes recent news, past issues of The Communicator, club history, photos, videos and other information.

# IN THIS ISSUE

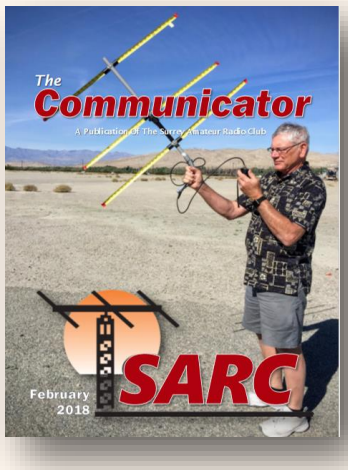
click on the page number below

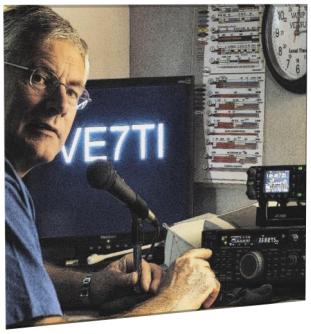




## *On The February Cover…*

*This issue of The Communicator has a great deal of attention directed toward working Low Earth Orbit Amateur Radio satellites—long distance repeaters in the sky! I have been doing this off and on as part of the hobby for several years, highlighted by a Space Station Astronaut contact in 2014. This is a timely topic because now is a particularly good time to try it. There are several new satellites that are quite workable with very modest VHF/UHF equipment. Here I am in Palm Springs with a home-built tape measure Yagi and my Baofeng UV-5R monitoring the new AO-92 sat.*






# QRM

...from the Editor's Shack

*Do you have a photo or bit of club news to share?*
*An Interesting link?*

*Something to sell or something you are looking for?*
*eMail it to* ***communicator @ ve7sar.net*** *for inclusion in this publication.*

It is always satisfying to receive feedback and stats to show that folks actually read what we offer. It is usually after the first of the month, when the new issue of the Communicator has been published. Our new blog site (ve7sar.blogspot.ca) generates the most feedback. In particular, 2 posts have generated the majority of response. Stan's QRT in the December issue, "A Call For Your Opinion" soliciting ideas on future direction, to ensure the continuation of the hobby, has over 300 individual views to date. And yes, Stan has promised a recap for a future issue. The other was in response to the article in January "All About The Baofeng UV-5R". It is obviously a popular transceiver. Interesting too that many of the views from that post came from the Ukraine. Could that have had something to do with the photo of the militia member with a UV-5R?

One reader of "All about the Baofeng UV5-R" remarked:

*"Just what I need! I am trying to get back into the hobby after 35+ years away. I have one of these, or at least the current UV-82 version. I have bought one of the adapters (Lee's Electronics on Fraser Street in Vancouver) and I have an X30 antenna to connect to the radio. The antenna is on a stand outside. My unit came with a lapel microphone. I have very little insight into programming the unit other than that I did manage to get VE7RPT to work. I have the programming cable. My only quibble so far is the consistent reports of low audio with this radio. I've stopped using the front panel mic and only use the lapel mic. It is a little better. I will be studying this article further. Thanks for publishing it."*

Thanks for your feedback, please keep it coming!

We're pleased that, other than the flu bug, there are no reports of sick or injured Amateurs locally this month. Robert VA7FMR is back on his feet after a lengthy convalescence and his experience as a novice CW user is this month's QRT. It offers an avenue even for those with no CW experience who wish to try this mode.

Most of this issue highlights the opportunities to work Amateur Radio satellites. It can be done with a handheld and a modest antenna, you'll even find plans to build two inexpensive ones here this issue.

*~ John VE7TI*
*Communicator Editor*

## On the Web

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Between newsletters, watch your e-mail for news, announcements of Amateur Radio events, monthly meetings and training opportunities.

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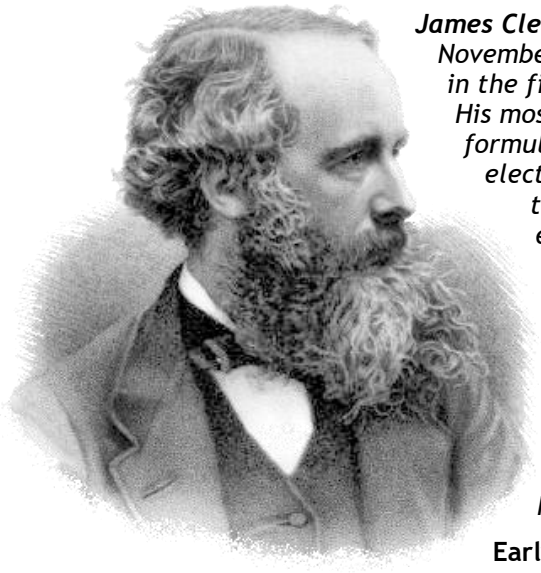
*Make an empty space in any corner of your mind, and creativity will instantly fill it—Dee Hock*

# The Rest Of The Story…

## James Clerk Maxwell

### *Pioneer of Electromagnetic Radiation*



***James Clerk Maxwell*** *(13 June 1831 – 5 November 1879) was a Scottish scientist in the field of mathematical physics. His most notable achievement was to formulate the classical theory of electromagnetic radiation, bringing together for the first time electricity, magnetism, and light as different manifestations of the same phenomenon. Maxwell's equations for electromagnetism have been called the "second great unification in physics" after the first one realized by Isaac Newton.*

**Early Life, 1831–1839**

James Clerk Maxwell's birthplace at 14 India Street, Edinburgh, it is now the home of the James Clerk Maxwell Foundation.

His father was a man of comfortable means of the Clerk family of Penicuik, holders of the baronetcy of Clerk of Penicuik. His father's brother was the 6th Baronet. He had been born "John Clerk", adding the surname Maxwell to his own after he inherited (as an infant in 1793) the Middlebie country estate near Corsock, Kirkcudbrightshire, from connections to the Maxwell family, themselves members of the peerage. Maxwell's parents met and married when they were well into their thirties; his mother was nearly 40 when he was born. They had had one earlier child, a daughter named Elizabeth, who died in infancy.

When Maxwell was young his family moved to Glenlair House, which his parents had built on the 1,500 acres (610 ha) Middlebie estate. All indications suggest that Maxwell had maintained an unquenchable curiosity from an early age. By the age of three, everything that moved, shone, or made a noise drew the question: "what's the go o' that?" In a passage added to a letter from his father to his sister-in-law Jane Cay in 1834, his mother described this innate sense of inquisitiveness:

He is a very happy man, and has improved much since the weather got moderate; he has great work with doors, locks, keys, etc., and "show me how it doos" is never out of his mouth. He also investigates the hidden course of streams and bell-wires, the way the water gets from the pond through the wall.

**Education, 1839–1847**

Recognizing the potential of the young boy, Maxwell's mother Frances took responsibility for James's early education, which in the Victorian era was largely the job of the woman of the house. At eight he could recite long passages of Milton and the whole of the 119th psalm (176 verses). Indeed, his knowledge of scripture was already detailed; he could give chapter and verse for almost any quotation from the psalms. His mother was taken ill with abdominal cancer and, after an unsuccessful operation, died in December 1839 when he was eight years old. His education was then overseen by his father and his father's sister-in-law Jane, both of whom played pivotal roles in his life. His formal schooling began

unsuccessfully under the guidance of a 16 year old hired tutor. Little is known about the young man hired to instruct Maxwell, except that he treated the younger boy harshly, chiding him for being slow and wayward. The tutor was dismissed in November 1841 and, after considerable thought, Maxwell was sent to the prestigious Edinburgh Academy. He lodged during term times at the house of his aunt Isabella. During this time his passion for drawing was encouraged by his older cousin Jemima.

**Edinburgh Academy**

The 10 year old Maxwell, having been raised in isolation on his father's countryside estate, did not fit in well at school. The first year had been full, obliging him to join the second year with classmates a year his senior. His mannerisms and Galloway accent struck the other boys as rustic. Having arrived on his first day of school wearing a pair of homemade shoes and a tunic, he earned the unkind nickname of "Daftie". He never seemed to resent the epithet, bearing it without complaint for many years. Social isolation at the Academy ended when he met Lewis Campbell and Peter Guthrie Tait, two boys of a similar age who were to become notable scholars later in life. They remained lifelong friends.

Maxwell was fascinated by geometry at an early age, rediscovering the regular polyhedra before he received any formal instruction. Despite winning the school's scripture biography prize in his second year, his academic work remained unnoticed until, at the age of 13, he won the school's mathematical medal and first prize for both English and poetry.

Maxwell's interests ranged far beyond the school syllabus and he did not pay particular attention to examination performance. He wrote his first scientific paper at the age of 14. In it he described a mechanical means of drawing mathematical curves with a piece of twine, and the properties of ellipses, Cartesian ovals, and related curves with more than two foci. His work "Oval Curves" was presented to the Royal Society of Edinburgh by James Forbes, a professor of natural philosophy at the University of Edinburgh, because Maxwell was deemed too young to present the work himself. The work was not entirely original, since René Descartes had also examined the properties of such multifocal ellipses in the 17th century, but he had simplified their construction.

**University of Edinburgh, 1847-1850**

Maxwell left the Academy in 1847 at age 16 and began attending classes at the University of Edinburgh. He had the opportunity to attend the University of Cambridge, but decided, after his first term, to complete the full course of his undergraduate studies at Edinburgh. The academic staff of the University included some highly regarded names; his first year tutors included Sir William Hamilton, who lectured him on logic and metaphysics, Philip Kelland on mathematics, and James Forbes on natural philosophy. He did not find his classes at the University demanding, and was therefore able to immerse himself in private study during free time at the University and particularly when back home at Glenlair. There he would experiment with improvised chemical, electric, and magnetic

Maxwell is best known for his research in electromagnetic radiation, which unites the sciences of electricity, magnetism and optics.

Electricity flows through many metals because of the movement of electrons amongst the atoms of the metal. Moving electrons also produce a magnetic field, the strength of which depends on the number of moving electrons.

Electromagnets combine electricity and magnetism within one device, and fluctuating electron movements create electromagnetic waves.

Maxwell saw analogies between the speeds of travel of electromagnetic waves and of light, and devised four important mathematical equations which formulated these and other relationships between electricity and magnetism.

Some of Maxwell's results prompted Albert Einstein's research in relativity. Einstein is quoted as saying: 'One scientific epoch ended and another began with James Clerk Maxwell'.

*A young Maxwell at Trinity College, Cambridge. He is holding one of his colour wheels.*

apparatus, however his chief concerns regarded the properties of polarized light. He constructed shaped blocks of gelatin, subjected them to various stresses, and with a pair of polarizing prisms given to him by William Nicol, viewed the coloured fringes that had developed within the jelly. Through this practice he discovered photoelasticity, which is a means of determining the stress distribution within physical structures.

At age 18, Maxwell contributed two papers for the Transactions of the Royal Society of Edinburgh. One of these, "On the Equilibrium of Elastic Solids", laid the foundation for an important discovery later in his life, which was the temporary double refraction produced in viscous liquids by shear stress. His other paper was "Rolling Curves" and, just as with the paper "Oval Curves" that he had written at the Edinburgh Academy, he was again considered too young to stand at the rostrum to present it himself. The paper was delivered to the Royal Society by his tutor Kelland instead.

*This time is especially noteworthy for the advances Maxwell made in the fields of electricity and magnetism.*

**University of Cambridge, 1850–1856**

In October 1850, already an accomplished mathematician, Maxwell left Scotland for the University of Cambridge. He initially attended Peterhouse, however before the end of his first term transferred to Trinity, where he believed it would be easier to obtain a fellowship. At Trinity he was elected to the elite secret society known as the Cambridge Apostles. Maxwell's intellectual understanding of his Christian faith and of science grew rapidly during his Cambridge years. He joined the "Apostles", an exclusive debating society of the intellectual elite, where through his essays he sought to work out this understanding.

In November 1851, Maxwell studied under William Hopkins, whose success in nurturing mathematical genius had earned him the nickname of "senior wrangler-maker".

In 1854, Maxwell graduated from Trinity with a degree in mathematics. He scored second highest in the final examination, coming behind Edward Routh and earning himself the title of Second Wrangler. He was later declared equal with Routh in the more exacting ordeal of the Smith's Prize examination. Immediately after earning his degree, Maxwell read his paper "On the Transformation of Surfaces by Bending" to the Cambridge Philosophical Society. This is one of the few purely mathematical papers he had written, demonstrating Maxwell's growing stature as a mathematician. Maxwell decided to remain at Trinity after graduating and applied for a fellowship, which was a process that he could expect to take a couple of years. Buoyed by his success as a research student, he would be free, apart from some tutoring and examining duties, to pursue scientific interests at his own leisure.

The nature and perception of colour was one such interest which he had begun at the University of Edinburgh while he was a student of Forbes. With the coloured spinning tops invented by Forbes, Maxwell was able to demonstrate that white light would result from a mixture of red, green, and blue light. His paper "Experiments on Colour" laid out the principles of colour combination and was presented to the Royal Society of Edinburgh in March 1855. Maxwell was this time able to deliver it himself.

Maxwell was made a fellow of Trinity on 10 October 1855, sooner than was the norm, and was asked to prepare lectures on hydrostatics and optics and to set examination papers. The following February he was urged by Forbes to apply for the newly vacant Chair of Natural Philosophy at Marischal College, Aberdeen. His father assisted him in the task of preparing the necessary references, but died on 2 April at Glenlair before either knew the result of Maxwell's candidacy. Maxwell accepted the professorship at Aberdeen, leaving Cambridge in November 1856.

**Marischal College, Aberdeen, 1856–1860**

The 25-year-old Maxwell was a good 15 years younger than any other professor at Marischal. He engaged himself with his new responsibilities as head of a department, devising the syllabus and preparing lectures.

He committed himself to lecturing 15 hours a week, including a weekly pro bono lecture to the local working men's college. He lived in Aberdeen during the six months of the academic year and spent the summers at Glenlair, which he had inherited from his father.

He focused his attention on a problem that had eluded scientists for 200 years: the nature of Saturn's rings. It was unknown how they could remain stable without breaking up, drifting away or crashing into Saturn. The problem took on a particular resonance at that time because St John's College, Cambridge had chosen it as the topic for the 1857 Adams Prize. Maxwell devoted two years to studying the problem, proving that a regular solid ring could not be stable, while a fluid ring would be forced by wave action to break up into blobs. Since neither was observed, Maxwell concluded that the rings must be composed of numerous small particles he called "brick-bats", each independently orbiting Saturn. Maxwell was awarded the £130 Adams Prize in 1859 for his essay "On the stability of the motion of Saturn's rings"; he was the only entrant to have made enough headway to submit an entry. His work was so detailed and convincing that when George Biddell Airy read it he commented "It is one of the most remarkable applications of mathematics to physics that I have ever seen." It was considered the final word on the issue until direct observations by the Voyager flybys of the 1980s confirmed Maxwell's prediction.

**James and Katherine Maxwell, 1869**

In 1857 Maxwell befriended the Reverend Daniel Dewar, who was then the Principal of Marischal. Through him Maxwell met Dewar's daughter, Katherine Mary Dewar. They were engaged in February 1858 and married in Aberdeen on 2 June 1858. On the marriage record, Maxwell is listed as Professor of Natural Philosophy in Marischal College, Aberdeen. Seven years Maxwell's senior, comparatively little is known of Katherine, although it is known that she helped in his lab and worked on experiments in viscosity. Maxwell's biographer and friend, Lewis Campbell, adopted an uncharacteristic reticence on the subject of Katherine, though describing their married life as "one of unexampled devotion".

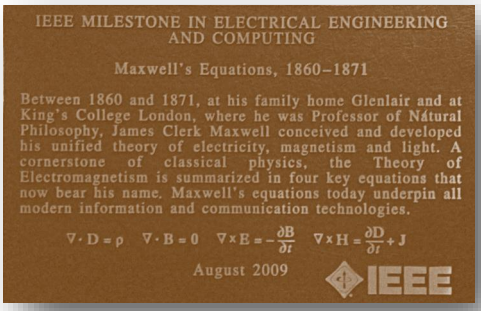
In 1860 Marischal College merged with the neighbouring King's College to form the University of Aberdeen. There was no room for two professors of Natural Philosophy, so Maxwell, despite his scientific reputation, found himself laid off. He was unsuccessful in applying for Forbes's recently vacated chair at Edinburgh, the post instead going to Tait. Maxwell was granted the Chair of Natural Philosophy at King's College, London, instead. After recovering from a near-fatal bout of smallpox in 1860, Maxwell moved to London with his wife.

**King's College, London, 1860–1865**

Maxwell's time at King's was probably the most productive of his career. He was awarded the Royal Society's Rumford Medal in 1860 for his work on colour and was later elected to the Society in 1861. This period of his life would see him display the world's first light-fast colour photograph, further develop his ideas on the viscosity of gases, and propose a system of defining physical quantities—now known as dimensional analysis. Maxwell would often attend lectures at the Royal Institution, where he came into regular contact with Michael Faraday. The relationship between the two men could not be described as being close, because Faraday was 40 years Maxwell's senior and showed signs of senility. They nevertheless maintained a strong respect for each other's talents.

This time is especially noteworthy for the advances Maxwell made in the fields of electricity and magnetism. He examined the nature of both electric and magnetic fields in his two-part paper "On physical lines of force", which was published in 1861. In it he provided a conceptual model for electromagnetic induction, consisting of tiny spinning cells of magnetic flux. Two more parts were later added to and published in that same paper in early 1862. In the first additional part he discussed the nature of electrostatics and displacement current. In the second additional part, he

*Maxwell's great contribution, in reformulating Faraday's law was to tie the laws into one theory unifying electric and magnetic fields and in predicting electromagnetic waves .*




dealt with the rotation of the plane of the polarization of light in a magnetic field, a phenomenon that had been discovered by Faraday and is now known as the Faraday effect.

**Later years, 1865–1879**

In 1865 Maxwell resigned the chair at King's College, London, and returned to Glenlair with Katherine. In his paper "On reciprocal figures, frames and diagrams of forces" (1870) he discussed the rigidity of various designs of lattice. He wrote the textbook Theory of Heat (1871) and the treatise Matter and Motion (1876). Maxwell was also the first to make explicit use of dimensional analysis, in 1871.

In 1871 he became the first Cavendish Professor of Physics at Cambridge. Maxwell was put in charge of the development of the Cavendish Laboratory, supervising every step in the progress of the building and of the purchase of the collection of apparatus. One of Maxwell's last great contributions to science was the editing (with copious original notes) of the research of Henry Cavendish, from which it appeared that Cavendish researched, amongst other things, such questions as the density of the Earth and the composition of water.

Maxwell died in Cambridge of abdominal cancer on 5 November 1879 at the age of 48. His mother had died at the same age of the same type of cancer. The minister who regularly visited him in his last weeks was astonished at his lucidity and the immense power and scope of his memory.

**Electromagnetism**

Maxwell had studied and commented on electricity and magnetism as early as 1855 when his paper "On Faraday's lines of force" was read to the Cambridge Philosophical Society. The paper presented a simplified model of Faraday's work and how electricity and magnetism are related. He reduced all of the current knowledge into a linked set of differential equations with 20 equations in 20 variables. This work was later published as "On Physical Lines of Force" in March 1861.

Around 1862, while lecturing at King's College, Maxwell calculated that the speed of propagation of an electromagnetic field is approximately that of the speed of light. He considered this to be more than just a coincidence, commenting, "We can scarcely avoid the conclusion that light consists in the transverse undulations of the same medium which is the cause of electric and magnetic phenomena."

Working on the problem further, Maxwell showed that the equations predict the existence of waves of oscillating electric and magnetic fields that travel through empty space at a speed that could be predicted from simple electrical experiments; using the data available at the time, Maxwell obtained a velocity of 310,740,000 metres per second (1.0195×109 ft/s). In his 1864 paper "A Dynamical Theory of the Electromagnetic Field", Maxwell wrote, "The agreement of the results seems to show that light and magnetism are affections of the same substance, and that light is an electromagnetic disturbance propagated through the field according to electromagnetic laws".

His famous twenty equations, in their modern form of four partial differential equations, first appeared in fully developed form in his textbook A Treatise on Electricity and Magnetism in 1873. Most of this work was done by Maxwell at Glenlair during the period between holding his London post and his taking up the Cavendish chair. Maxwell expressed electromagnetism in the algebra of quaternions and made the electromagnetic potential the centrepiece of his theory. In 1881 Oliver Heaviside replaced Maxwell's electromagnetic potential field by 'force fields' as the focus of electromagnetic theory. Heaviside reduced the complexity of Maxwell's theory down to four differential equations, known now collectively as Maxwell's Laws or Maxwell's equations. According to Heaviside, the electromagnetic potential field was arbitrary and needed to be "murdered". The use of scalar and vector potentials is now standard in the solution of Maxwell's equations.

A few years later there was a debate between Heaviside and Peter Guthrie Tait about the relative merits of vector analysis and quaternions. The result was the realization that there was no need for the greater physical insights provided by quaternions if the theory was purely local, and vector analysis became commonplace. Maxwell was proven correct, and his quantitative connection between light and electromagnetism is considered one of the great accomplishments of 19th century mathematical physics.

Maxwell also introduced the concept of the electromagnetic field in comparison to force lines that Faraday described. By understanding the propagation of electromagnetism as a field emitted by active particles, Maxwell could advance his work on light. At that time, Maxwell believed that the propagation of light required a medium for the waves, dubbed the luminiferous aether. Over time, the existence of such a medium, permeating all space and yet apparently undetectable by mechanical means, proved impossible to reconcile with experiments such as the Michelson–Morley experiment. Moreover, it seemed to require an absolute frame of reference in which the equations were valid, with the distasteful result that the equations changed form for a moving observer. These difficulties inspired Albert Einstein to formulate the theory of special relativity; in the process Einstein dispensed with the requirement of a stationary luminiferous aether.

Surrey Amateur Radio Club

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# Back to Basics

John Schouten VE7TI

## *From The Basic Question Bank*

**B-006-007-003**

**What electromagnetic wave polarization does a Yagi antenna have when its elements are parallel to the Earth's surface?**

- **A. Horizontal**
- **B. Helical**
- **C. Vertical**
- **D. Circular**

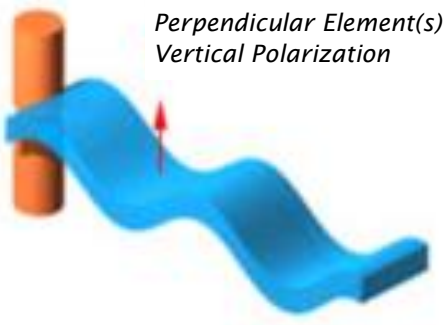
and

**B-006-007-004**

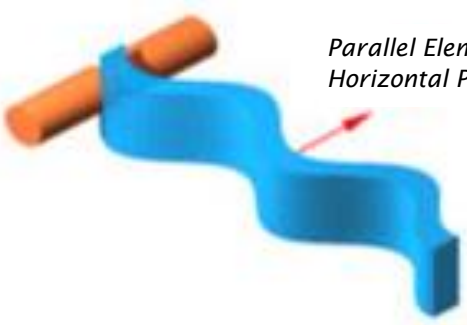
**What electromagnetic wave polarization does a half-wavelength antenna have when it is perpendicular to the Earth's surface?**

- **A. Vertical**
- **B. Circular**
- **C. Horizontal**
- **D. Parabolical**

As described in “The Rest of the Story” *(page 4)*, Scottish physicist James Clerk Maxwell figured out a theory of radio around 1864, and Heinrich Hertz proved that radio waves really did exist about 20 years later (they were called Hertzian waves in his honor for some time afterward). Several years later, at a meeting in Oxford, England on August 14, 1894, English physicist, Oliver Lodge, demonstrated how radio waves could be used for signaling from one room to another in what he later described as "a very infantile kind of radio-telegraphy." Lodge filed a US patent for "electric telegraphy" on February 1, 1898, describing apparatus for "an operator, by means of what is now known as 'Hertzian-wave telegraphy' to transmit messages across space to any one or more of a number of different individuals in various localities… " Unknown to Lodge at that stage, Guglielmo Marconi was carrying out his own experiments in Italy around the same time—and ultimately proved the better showman: many people think of him as the "inventor of radio" to this day whereas, in truth, he was only one of a group of forward-thinking people who helped turned the science of electromagnetic waves into a practical, world-changing technology.



*Perpendicular Element(s)*
*Vertical Polarization*



*Parallel Element(s)*
*Horizontal Polarization*

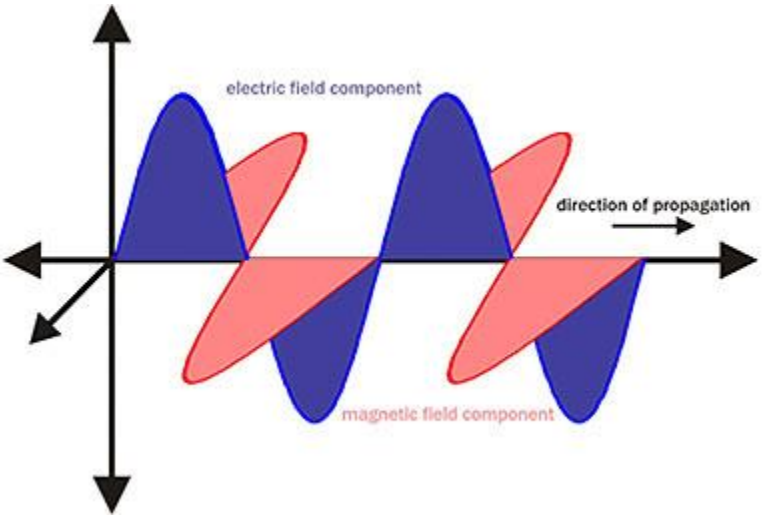
This month's look at the Basic Question Bank relates to the direction of electromagnetic radiation from an antenna. In the first question, a Yagi antenna with elements *parallel* to the Earth's surface, the second a vertical antenna *perpendicular* to the Earth's surface.

A transmitting antenna is a transducer that converts radio frequency electric current to electromagnetic waves that are then radiated into space. The electric field or "E" plane determines the polarization or orientation of the radio wave. In general, most antennas radiate either linear or circular polarization, the latter mostly in satellite communications. A linear polarized antenna radiates wholly in one plane containing the direction of propagation.

Horizontally polarized antennas have their electric field parallel to the Earth's surface. This is the common configuration for multi element HF Yagi antennas.

Man made radio noise is predominantly vertically polarized and the use of horizontal polarization would provide some discrimination against interference from noise. So the answer to the first question is **A. Horizontal**.

An antenna is said to be vertically polarized when its electric field is perpendicular to the Earth's surface. An example of a vertical antenna is the 'rubber-duckie' on a handheld or the "whip" antenna on an mobile installation.



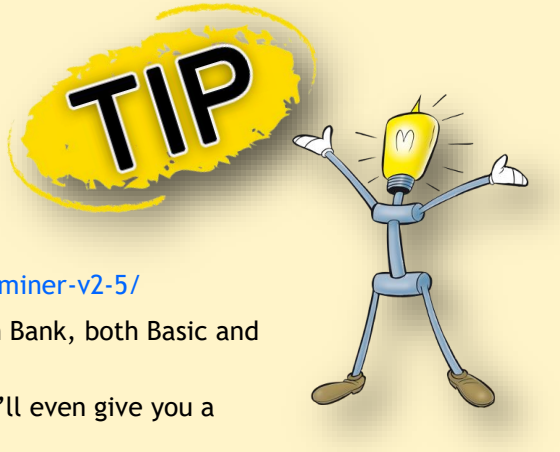

Vertical polarization is most often used when it is desired to radiate a radio signal in all directions such as widely distributed mobile units. Vertical polarization also works well in the suburbs or out in the country, especially where hills are present. As a result, nowadays most two-way Earth to Earth communications in the frequency range above 30 MHz use vertical polarization. So the answer to the second question in our example is **A. Vertical**.

Our next Basic Course starts April 3rd.

*~ John VE7TI*

## *Study Links*

Whether you are new to the hobby or brushing up on skills, you should find these study links helpful:




1. RIC-7 is the entire up-to-date Industry Canada (IC) Basic Question Bank. http://tinyurl.com/CanadaBasicQB
2. There is a RIC-7 that has some explanations along with the questions. RIC-7 2014rev08.05 with explanations.
3. The Amateur Radio Exam Generator is at: https://www.ic.gc.ca/eic/site/025.nsf/eng/h_00040.html
4. The ExHaminer Study software for Windows is at: https://wp.rac.ca/exhaminer-v2-5/
5. The Ham Study website has a flash card approach to learning the Question Bank, both Basic and Advanced. It is at: https://hamstudy.org

Contact SARC if you wish to write the Basic or Advanced Exam. If you pass we'll even give you a year's free membership!

# February 2018

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|---|---|---|---|---|---|---|
| | | | | 1 | 2 | 3<br>08-1000 Club Social: Kalmar Family Restaurant—King George Blvd & 81st Avenue<br>**CONTEST: BC QSO Party** |
| 4<br>**CONTEST: BC QSO Party** | 5 | 6<br>1930 SEPAR Net<br>2000 SARC Net | 7 | 8 | 9 | 10<br>08-1000 Club Social: Kalmar Family Restaurant—King George Blvd & 81st Avenue<br>**CONTEST: CQ WW WPX (RTTY)** |
| 11<br>**CONTEST: CQ WW WPX (RTTY)** | 12 | 13<br>1930 SEPAR Net<br>2000 SARC Net | 14<br>1900 SARC Monthly General Meeting | 15 | 16 | 17<br>08-1000 Club Social: Kalmar Family Restaurant—King George Blvd & 81st Avenue<br>**CONTEST: ARRL Inter. DX (CW)** |
| 18<br>**CONTEST: ARRL Inter. DX (CW)** | 19 | 20<br>1930 SEPAR Net<br>2000 SARC Net | 21 | 22 | 23 | 24<br>08-1000 Club Social: Kalmar Family Restaurant—King George Blvd & 81st Avenue<br>**CONTEST: NA QSO Party (RTTY)** |
| 25<br>**CONTEST: NA QSO Party (RTTY)** | 26 | 27<br>1930 SEPAR Net<br>2000 SARC Net | 28<br>**SARC Exec Meeting** | | | |

For details on all SARC events, go to ve7sar.net

For details on all SEPARS events, go to separ.shutterfly.com/calendar

Contest Details: http://hornucopia.com/contestcal/contestcal.html

# Page 13—News You Can Lose

The Lighter Side of Amateur Radio

## *Overly Ambitious Ham Kicked From Club*

*By K5KAC, on the scene*

**PATASKALA, OHIO** — Lukas Guzman, a 27 year-old newly licensed ham radio operator, was booted from the Flicking County Amateur Club last night during their annual meeting at Crusty's Wharf. When pressed for a reason, the other members simply stated that "he is too involved."

Overly ambitious ham radio operator Lukas Guzman, seen here checking his email while enjoying a cup of coffee

"He wanted us to get VE credentials and actually test new hams," exclaimed Mort Brenley. "He was always excitedly talking about working DX."

Guzman noted that he really felt the blowback when he brought up how much fun a DXpedition would be. "They looked at me like I had been inhaling contact cleaner," he said.

Tensions came to a head after everyone had their second helping of clam chowder. "I whipped out my typed to-do list, and everyone's face went green," said Guzman.

Brenley concurred. "He got to 'school outreach' and I saw Vernon fumbling for his nitro pills. I knew he had to be stopped."

There was an unanimous vote, 4-0, and Guzman was removed from the club.

"He is damn lucky we didn't toss him from the Highway 16 overpass into the South Fork of Flicking River."

As of press time, Guzman was updating his QRZ page, updating ACLog, memorizing his LOTW certificate code, replacing the electrolytic caps on an old Hallicrafters, applying for grants to buy a transceiver for his local elementary school, framing his license, and checking to see if a frequency was in use.

*~ Ham Hijinks*


*Left: Pretty Cool Radio Setup!*

Surrey Amateur Radio Club

# At The Last SARC Meeting

## January Meeting Minutes

***Wednesday, January 10, 2018***

*Location: EMBC South West PREOC*

With 21 members in attendance, President Stan Williams VA7NF welcomed the group to the first meeting of the new year.

### *Announcements*

Stan advised that Dave Thomson VA7THO has some health issues which will limit his attendance at future meetings. The membership sends its best wishes to Dave.

### *Financial Report*

Scott Hawrelak VE7HA was not able to provide a full statement as he is awaiting bank statements, however he noted that we still have a credit with Radioworld to cover our order of the Flex 6600.

Name badges are available from the last order and Scott will be taking orders now for next September at a cost of $10 each.

The net cost to SARC for the Christmas party was $519 with 51 attendees and 5 expected guests unable to attend.

Kjeld Fredericksen VE7GP suggested that consideration be given next year to holding the event at Porter's Restaurant near the Langley airport.

### *Membership Report*

John Brodie VA7XB reported that current membership stands at 110.

### *OTC*

John VA7XB reported that an OTC Committee meeting was held just before Christmas, which resulted in some decision regarding purchases. An ICOM IC-7610 has been ordered and is expected within a month. Additional items ordered include coax stand-offs for the tower, a cable support for our second TH7 beam and 3 new 24" monitors. Approx $6500 remains unspent for equipment. The next major decision pertains to whether we use the balance for purchase of a linear amplifier or another antenna. A meeting with the City of Surrey is planned for February to update our status at the OTC and issues with the site.

### *Field Day*

Sheldon Ward VA7XNL advised that an early decision needs to be made regarding leadership and participation in Field Day planning. John VA7XB noted that SARC was successful in its application for a $500 grant from the city of Surrey in support of Field Day 2018.

### *Website*

Jeremy Morse VE7TMY reported that as of January 2018 a new website has been created containing basic reference information for the club, with links from the main page to the club blog, Facebook, Youtube and Twitter.

### *Contest Group*

Sheldon VA7XNL stated that several contests are coming up, which offer good opportunities for those wishing to gain some operating experience. The BC QSO Party will take place Feb 3-4.

### *Satellite Group*

Although the satellite group has been quiet in recent months, Art Witmans VE7WAE expressed a desire that it should become more active and take advantage of new opportunities to make contact through a number of recently-launched satellites.

### *Presentation*

Stan VA7NF made a presentation on

a) how the spectrum analyzer of a Flex radio was used to identify RFI originating from DSL lines, and

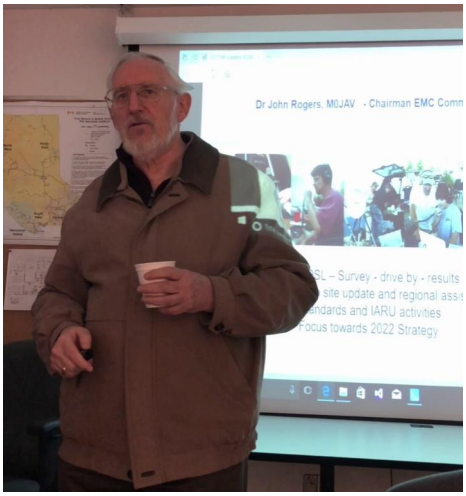
b) interference issues between USB 3.0 devices. See:

RSGB VDSL
http://rsgb.org/main/files/2017/08/2017-RFI-Update-RSGB-Convention.pdf

USB 3.0 whitepaper
www.intel.ca/content/www/ca/en/io/universal-serial-bus/usb3-frequency-interference-paper.html

The meeting was adjourned at 9:10 pm.

*~ Jeremy VE7TMY*




# *Surrey Building $4.4M Fire Service Training Centre*

**New facility will replace existing 1976 building on same property**

*Amy Reid—Peace Arch News*

Surrey Fire Service is getting a new training centre.

The 12,000-square-foot facility will replace the existing 1976 wood frame training building, according to a city report, and will also provide multi-function classrooms, simulation spaces, offices and meeting facilities. It will be built on the same property as the current Surrey Fire Services Central Training Facility, at 14923 64th Ave., directly adjacent to fire hall nine and the department's mechanics shop.

Deputy Fire Chief John Lehmann said the new facility will have four classrooms (two 60-person rooms and two 30-person rooms), six offices for training officers and instructors, as well as storage and support rooms.

The site will also have "state of the art, modern classrooms including one classroom that opens up to the training ground through roll-up doors," he said. Lehmann noted it will "complement the existing 40 seat classroom, live fire (propane) burn building and Special Operations training props."

Last month, the City of Surrey awarded a nearly $4.4 million contract to KDS Construction Ltd. to build the new facility.

It is expected to open in the fall of 2018.


*A rendering of the new training centre.*
*Photo: Surrey Fire Service*

Surrey Emergency Program
Amateur Radio

# The SEPAR Report

Roger Andrews VA7VH - SEPAR Coordinator

## *The Surrey Emergency Program*

*Roger was under the weather with the flu this month so I resurrected a past SEPAR Report that is still very much a current topic.-Ed.*

### *The Surrey Emergency Program*

The Surrey Emergency Program is working to make sure Surrey is ready in the event of an emergency. Our Emergency Program Coordinator and staff regularly meet with the Surrey Emergency Program Volunteers and GVRD jurisdictions to discuss and plan emergency preparedness. Our preparations include:

- Table-Top Exercises - by using a model, we walk through a pre-planned disaster scenario to test our resources.
- Mock Disaster Exercise - utilizes our field and emergency response personnel to respond to a full-scale scenario as if it were actually the real event.

The Surrey Fire Service has been responsible for the Emergency Program since January 1994. Surrey's Emergency By-law provides for the establishment, administration and operation of an Emergency Plan and Program for the City.

The Surrey Emergency Program offers presentations on personal emergency preparedness and Neighbourhood Emergency Preparedness to neighbourhoods, private groups, schools, and organizations upon request.

Contact the Surrey Emergency program by email at surreyemergencyprogram@surrey.ca or call 604-543-6795 for more information.

### *Reception Centres*

The City of Surrey designated six reception and evacuation centres in to support residents in the event of a disaster.

In the event of an emergency or disaster, reception centres will be established for registration and inquiry.

The number of reception centres opened will depend on the nature of the situation and the evacuation measures. Listen to your battery-powered radio for further information.

### *Emergency Social Services (ESS)*

Emergency Social Services (ESS) are those services required to preserve the well-being of people affected by an emergency or disaster.

The ESS program is a **provincial emergency response program,** but involves various levels of government. The program gives short-term help to British Columbians who have to leave their homes because of disasters like fires, floods or earthquakes.

Surrey's Emergency Social Services Program is a team of City of Surrey staff and volunteers, who are called out at any time of the day or night to respond to the needs of people affected by an emergency.

### *Surrey Emergency Program Amateur Radio (SEPAR)*

"Calling the Surrey Emergency Program Amateur Radio Net."

This is what you'll hear when you tune in to Surrey Emergency Program Amateur Radio (SEPAR) weekly net Tuesday evening at 7:30pm. This directed net meets weekly to test equipment and practice response readiness. See below for further Net information.

### *SEPAR Volunteers Helping Out In Emergencies*

SEPAR is not a club but a service to the City of Surrey. SEPAR volunteers are **trained radio operators** willing to take direction and help out when needed in an event. The organization is directed and guided by the Surrey Emergency Program, which administers SEPAR through the Surrey Fire Service.

SEPAR members would be called out at the request of the Emergency Coordinator or the Provincial Emergency Program (PEP). Volunteer callout is done in a number of ways, including

- paging,
- telephone, and of course,
- Amateur Radio.

SEPAR provides the station equipment and training. You get the satisfaction of doing your part in an emergency.

In the event of a natural disaster, it is very probable that existing communications would be severely degraded, or even knocked out entirely. As a part of Surrey's Emergency Plan, SEPAR has been developed to be the link between the responding agencies, government department and support teams.

All of these agencies will need to be in contact with each other and the Field Response Centre(s), both at the disaster site and at area Operations Centres

SEPAR is recruiting volunteers for this essential community service and if you are interested we would be pleased to meet with you to provide more information. You may contact us via mail@separs.net or through the Emergency Program Administrative Coordinator:

Lorraine Wilson
SurreyEmergencyProgram@surrey.ca
604.543.6795

We need to remember that we do this training because there is always the real possibility that a major event will occur. It is not a matter of IF a major disaster will occur but WHEN.

### *Weekly Nets*

Every Tuesday evening at 1930 hrs (7:30pm PDT) we start a ½ hour NET on a local repeater provided by the Surrey Amateur Radio Club (SARC) on 147.360 MHz +600kHz and a tone of 110.9. There may be a simplex test or a test NTS message transmitted during the NET at the Net controllers discretion. This is an excellent opportunity to practice sending and receiving this form of messaging. Besides, it adds a little spice to the regular check-ins on the net. Please join us. NTS Radiograms can be found on the SEPAR website here, or, if you would like a fillable PDF that you can enter on your computer, you can get it from here.

Thursday nights at 19:30 hours, This Net has changed! We are no longer doing a regular 2 meter simplex Net on this night. Any plans for Thursday night will be announced on the Tuesday before. This night will now be used for optional tests. For example NTS Digital exchanges, 6 meter, 2 meter 60 cm and 220 Nets. If someone wants to do a particular net on a Thursday, then please announce it on the Tuesday before.


Surrey Emergency Program Amateur Radio

# *Your Opportunity To Get Into Satellites In A BIG Way!*

John VA7XB has a complete satellite station for sale. For further information, contact him at **604-591-1825**


## For Sale $3000

### Satellite Equipment Complete and Working

| MFR | MODEL | DESCRIPTION | Price When New $C | |
|---|---|---|---|---|
| **Icom** | IC-910H fully loaded, compl with | VHF/UHF transceiver | | |
| | UX910 | 1.2 GHz band unit | 2,830 | |
| | FL132 | main band CW filter | | |
| | FL133 | Sub band CW filter | | |
| | CR293 | high stability crystal unit | | |
| | UT106 | DSP unit x 2 | | |
| **Icom** | CT-17 | CI-V level converter | 160 | |
| **Alinco** | DM330MV | power supply | 300 | |
| **Yaesu** | G5500 | AZ-EL rotator, controller + cable | 1,128 | |
| **Fox Delta** | ST3 | Sattrack interface | 115 | |
| **Daiwa** | 140-525 MHz | Power/SWR meter | 150 | |
| **West Mountain** | 4005 | RigRunner 12 power distr panel | 50 | |
| **Diamond** | MX3000N | 144/440/1200 MHz | 110 | |
| | | serial to USB adaptor x 2 | 80 | est |
| | 10 ft tower | with insulated boom | 20 | est |
| **Cushcraft** | A148-20T | 10/10-el 2m cross yagi | 275 | |
| **Unknown** | | 20/20-el 440 cross yagi | 300 | est |
| **DX Engineering** | DXE-400 | 60 ft x 2 with connectors | 120 | |
| **Toshiba** | Satellite | laptop with XP & software | 0 | |
| | | | **5,638** | |


# North Shore ARC

## Report on NSARC's Winter Field Day

*George Merchant VE7QH publishes the weekly newsletter 'Contact' for the North Shore Amateur Radio Club.*

NSARC's 2018 Winter Field Day effort generated 42 QSOs on 4 bands using 2 modes amidst the adverse conditions we wanted. The farthest QSOs were with stations in Florida, Mexico, and Hawai'i. 20 metres provided most contacts, followed by 40 and 80. Attempts on 15, 10, 6, and 1.25 metres yielded no contacts or even stations heard. Antennas included a Slim Jim(tm) J-pole for VHF, a CHA HYBRID-MICRO (tm) end-fed all-band and NSARC's 20-40-80 metre dipole for HF. Radios included Daniel's QYT KT-8900D, NSARC's TS-480, and Joe's TS-590.

Adam's solar-charged batteries provided the electricity. Team members set up the elaborate tent and antennas in the cold rain the morning of the event, getting VE7NSR (Never Stops Raining) on the air at 11:21 am. Shortly thereafter, North Shore News journalists appeared, interviewed us with thoughtful questions, and took many photos. QSOs were scarce at first as stations we could hear, did not hear us.

Saturday afternoon provided a better QSO rate. Activity shifted to longer wavelengths as the sky darkened. We wrapped up at 8pm just after obtaining the mode-band- 3—multiplier of CW-80m. To our surprise, the tent survived the night and continued to serve nervous hams in Sunday's strong winds after we fortified the tent with additional guys staked to the ground and tied around a tree and park bench.

Despite extreme discomforts of the cold, rain, and wind, all participants applied their ingenuity to solve myriad challenges, enjoyed the experience, improved their skills and knowledge, and are eager to do something similar next winter or sooner. We hope to equip ourselves with sturdier shelter, directional antennas at greater height, and maybe a fierce blizzard to keep us challenged next time.

Congratulations go to the Team, including Joe-VE7JYH, Fran-VE7JL, PeterVA7PMN, Daniel-VA7DDV, Adam-VA7KRZ, and Halden-VE7UTS. Bob-VE7RPX, IgorVE7AXO, and Heather-VE7HEA provided substantial additional on-site help. The Team also thanks NSARC, its board members, and Metro Vancouver Regional District for supporting the event and several other NSARC members who visited the station, including Nick-VA7NRM who showed up twice.

*Daniel VA7DDV and Peter VA7PMN*

North Shore Amateur Radio Club

# British Columbia QSO Party 2018

Rebecca Kimoto VA7BEC

## *1600z Feb 3 to 0359z Feb 4 AND 1600z to 2359z Feb 4*

*You are cordially invited to BCQP 2018. The official invitation is attached, and you will see one major change — EXTENDED HOURS!*

BCQP 2018 will run in two blocks over the weekend, with the usual 12 hours on Saturday, 8am - 8pm local time, as well as eight hours on Sunday, 8am to 4pm. You can work all 20 hours of the contest or a few hours on Saturday and a few hours on Sunday, or just Saturday or just Sunday. Completely up to you. There is no required off-time or on-time, for that matter. Sunday operation is simply an option, particularly for CW operators who like BCQP but find their efforts derailed when NA Sprint CW starts. Digital operators may also find the going easier because the XE RTTY Contest will have finished. But please remember, BCQP Saturday and Sunday operation is NOT split by mode. Operate Phone, CW and/or digital, as you wish, on one day or both during the designated blocks of time.

So… mark your new calendar, if it isn't already marked.

February 3, local time, 8am to 8pm AND February 4 8am to 4pm

That's UTC 1600z Feb 3 to 0400z Feb 4 and 1600z to 2359z Feb 4

One other change: The e-mail address for log submission.

Send to va7bec [at] rac [dot] ca

Rules, tools, helpful hints, in-depth event analysis/reports and scores from past years, examples of the lovely photo-based certificates and plaques... all available for viewing from links on the BCQP page of the Orca DXCC website. Go to http://www.orcadxcc.org/bcqp.html or click on the links below.

### *Certificates and Plaques*

As a past participant, you know that top scores in every class of entry receive a one-of-a-kind certificate showcasing beautiful BC — different photo every year taken especially for this event. Definitely shack-worthy. Add to your collection.

In addition, with the support of amateur radio clubs, businesses and individuals, we offer a terrific plaque program. For 2018, we have nine categories: Top BC Score (Single-Op), Top YL Score, Top Score Canada Outside BC, Top US Score, Most Electoral Districts Contacted, Top DX, Top Mixed Mode, Top Club Score in BC and Top BC Score (Multi-Op).

We will continue to recognize the top score in each federal electoral district with a special certificate. All that is required to qualify is to submit a log with at least 10 valid QSOs. As an aside, there are 42 districts and many do not get activated or participants don't bother sending in a log.

So help me spread the word — BCQP has beautiful certificates, and BC stations have a much higher chance of capturing a certificate in BCQP than in any other type of on-air event.

To see how the 2017 certificates and plaques turned out, go to http://www.orcadxcc.org/bcqp_awards.html

### *The Spotlight Is on BC*

BCQP is one of very few regular events — maybe THE ONLY ONE — that puts BC in a spotlight, and since BC stations can contact anyone anywhere, including other BC stations, calling "CQ" will definitely attract attention even when band conditions are terrible.

Objectives:

Stations in British Columbia contact other stations in the province as well as the rest of Canada, the United States and beyond.

Stations outside British Columbia make contacts with VE7/VA7 stations.

Collectible, original photo certificates and BC-themed keepsakes for top scores in all classes, BC and outside BC. New photo every year!

Special photo certificates for top score in each federal electoral district.

Plaques awarded in nine (9) sponsored categories: Top YL, Top BC, Top US, Top Canada outside BC, Top DX, Top Mixed Mode, Most Federal Districts Contacted, Top Club in BC and Top Multi-Op

BCQP is fully supported by N1MM contest logging software, CQ/X GPS enabled software for mobile contesting, N3FJP state QSO party logging programs and several other generic programs.

Follow links at http://orcadxcc.org/bcqp.html for rules, tools, helpful hints, and in-depth event analysis/reports and scores from past years.

Join Orca DXCC in BCQP 2018. It's a whale of a good time!

### *Questions?*

Questions? I'm just an email away.

*~ Rebecca VA7BEC*
*Contest Coordinator for BCQP, Orca DXCC*

*BCQP is one of very few regular events — maybe THE ONLY ONE — that puts BC in a spotlight*

# What The Tech?

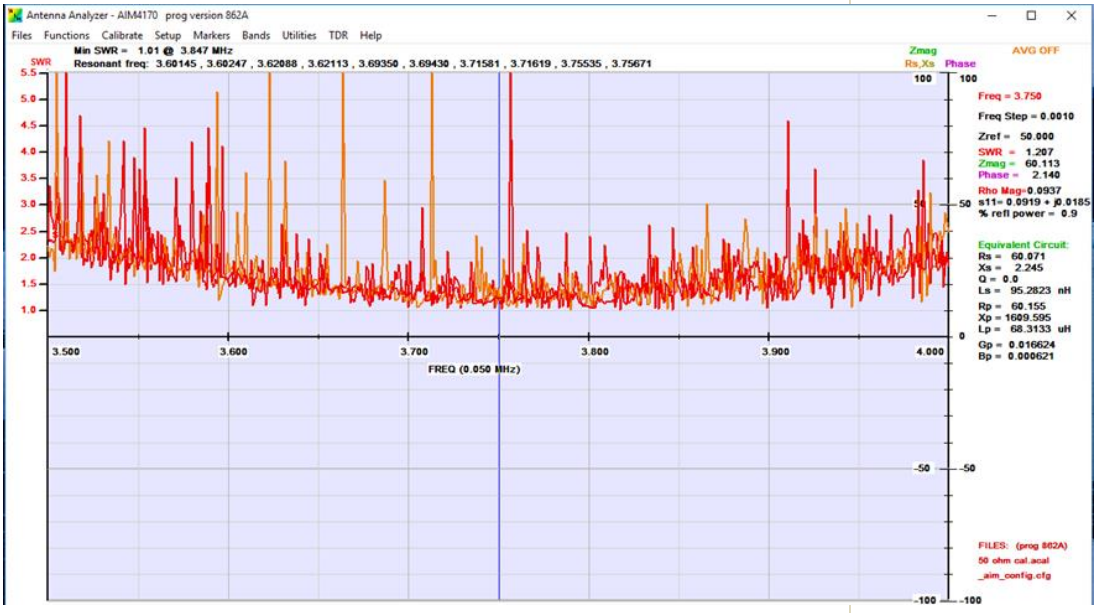
John Brodie VA7XB


## *3 Different Analyzers: 3 Different Results*

**VA7NF Helps Explain What is Going On Here**…

### Part 1 – Measurements Made at the Antenna

In last month's Communicator, I described my experience with modeling and construction of a quarter wave 80 m inverted L antenna. I stated that, while the model reliably predicted the real-life behaviour of the antenna, there were also some puzzling results beyond my understanding with the use of various antenna analyzers, so I asked Stan VA7NF to apply his technical expertise to interpretation. Other readers' comments are also invited. Here is a summary of my questions and Stan's explanations:




Because the feedpoint of the antenna is at ground level, I was able to make one set of measurements without the feedline present then a second set at the station location with the feedline present.

An AIM 4170 analyzer was connected to the antenna at the feedpoint by a 1 m long RG8X jumper. I first adjusted the series capacitor at the feedpoint to bring series reactance (Xs) to zero at 3750 KHz. Initially, each scan and re-scan produced the SWR curves below, showing a large number of random spikes, with each re-scan producing another set of spikes at different frequencies. The first scan *[below]* is in red; the re-scan is in orange.

Could the noisy behaviour be the result of strong signals being pickup up by the antenna and interfering with the reflected wave or electronics of the instrument? To check for the presence of out-of-band signals, I used the AIM 4170 band sweep function from 0.500 MHz (the low end of the broadcast band) to 5 MHz (above the 80 m band) as shown in the graph on the next page. This illustrates two strong, off-scale signals in the AM band (CKST at 1040 and CFTE at 1410 KHz) plus another unidentified signal at 2.0 MHz.

As I continued with my measurements, the odd behavior shown in the first graph abruptly ceased and I was unable

to reproduce it again. I believe that the improvement came about after all the connections were thoroughly tightened, but it was also coincidentally about the time the weather changed from a prolonged cold, dry spell to very wet. From that time on, the curves looked "smoother".


*Stan's comments:*

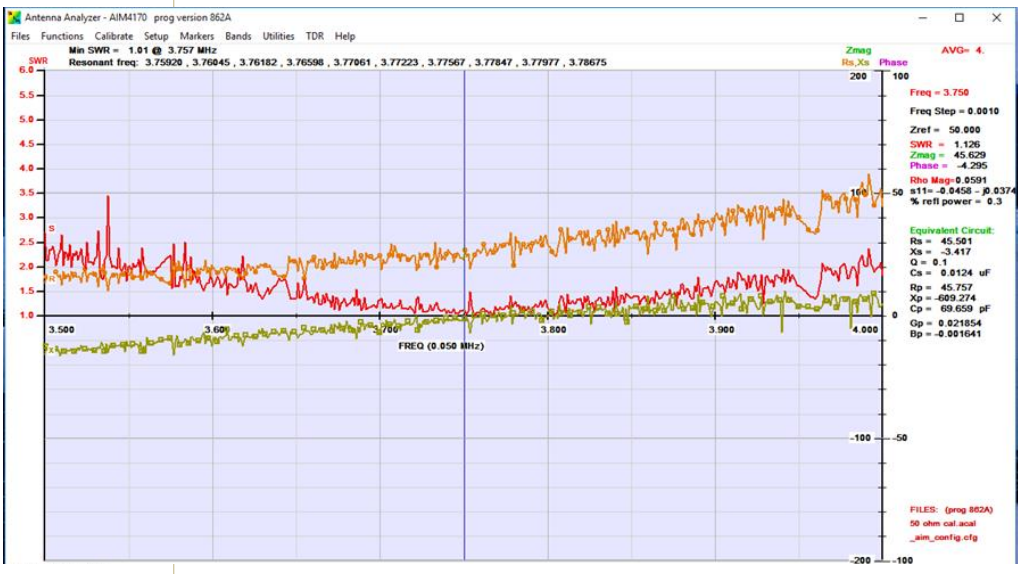
*Your assumptions above are well founded. Antenna analyzers will send short bursts of RF into the test device (antenna) while monitoring the strength of the return signal. For short antennae this will normally only be the reflection of its signal; when longer (80M or 160M or our FD antenna 320m) there will be many other strong signals especially the broadcast stations as you noted.*

*This is where analyzers differ. Newer ones have Rx filtering that follow the transmit frequency; older ones take a voltage reading of everything on the antenna. That means the readings are significantly affected by "stray" signals, making them useless in strong fields anywhere in the spectrum.*

*Your comment about the "noise" changing appears to be directly related to tightening the connectors. Those two AM stations will mix with themselves, other lesser strength signals, and noise presenting the peaks you saw. By making a better connection the diode effect of the poor junction has been removed eliminating the mixing products you saw. Aside from analyzers, any diode (rusty tower bolts, wire fence supports, etc) will mix these strong stations with noise that becomes several S unit Rx background noise. Doing the math, the 4 large spikes (3620 -3760) appear to be the sum of (1040 + 1410) mixing with 4 other local broadcast stations; also a 3rd peak exists at 2450 being 1040 + 1410.*

*Incidentally, our 80M antenna at the OTC is producing such images and should also be investigated.*

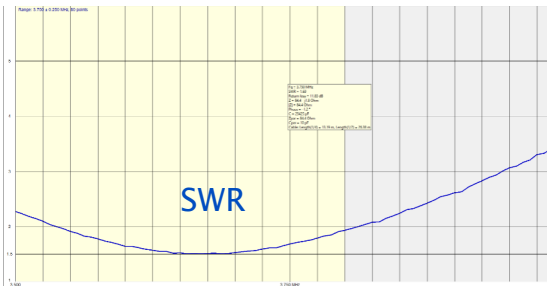
Once the noisy data quietened down, and again scanning with the AIM 4170, the graph *[below]* showed an SWR close to 1.0, reactance near 0 and R not far off 50 Ω at 3750 KHz. It doesn't ever get much better than this, but could I believe it? I decided to check with another instrument.




Measurements were again made at the antenna, but now using the AA-600 analyzer – results were somewhat different.

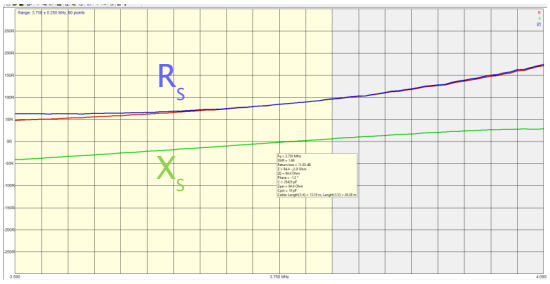
As seen in the graphs below, the minimum SWR was now higher at 1.5 but also shifted lower in frequency from 3750 KHz. Note that

at 3750 KHz, the reactance was still showing zero but $R_s$ was around 80 Ω, thereby accounting for the higher SWR. These results were more in line with my expectations but why did two high-quality instruments show such different results?




*Stan's Comments:*

*A major part of your low SWR is by design; you have tuned out $X_s$ by adjusting the series capacitor; at 3750 your $X_s$ went from -ve to +ve (tuned resonance) and the Rx value at that frequency as reported by the AIM was 50 ohms. The RigExpert agrees with AIM that $X_s$ crosses over at 3750 but it says $R_s$ is around 80 ohms and drops as the frequency drops. The >50 ohm Rx and -ve $X_s$ combine below 3750 for the lower SWR. It is unknown why there a difference in $R_s$ from 50 to 80 ohms.*



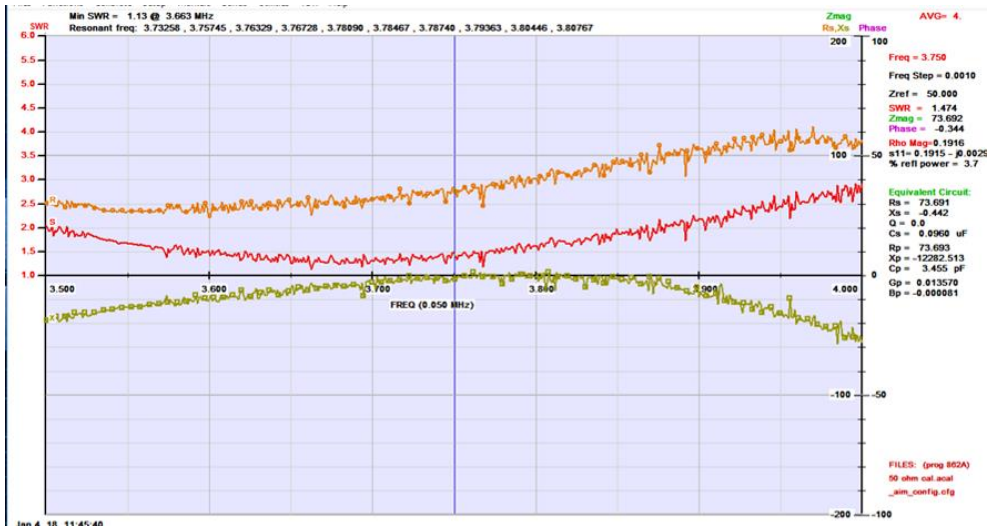

**Conclusion:** Because they develop different $R_s$ values the SWR curves are different. By observation there is significant noise still on the wire and that may be the basis of the differences.

Continuing at the antenna, measurements were now made with an MFJ 269 analyzer. *[right]*


At 3750 MHz regardless of frequency, the SWR was off-scale (∞) consistent with an unchanging $R_s$=0 and, in addition, $X_s$ varying erratically, i.e. it was not possible to get a meaningful measurement (note it was confirmed that the analyzer returned appropriate readings when tested with a 50 ohm dummy load and at 20 m on the author's beam, so the meter seemed to be "working"). Was this possibly another strong-AM signal interference problem?

*Stan's Comments:*

*Agree. Too much broadband noise for this meter to function. Not usable on a real antenna with a long length of copper.*




## *Part 2—Measurements Made at Station*

Next, a length of new LMR-400 coax plus a short jumper were attached to the feed point along with a second common mode choke close to the station end, but otherwise conditions were unchanged from earlier. All the following measurements were made at the station end of the transmission line and jumper.

The AIM 4170 produced SWR, $R_s$ and $X_s$ curves across the band. *[left]* Zero reactance occurred now at a higher frequency than previously,

and instead of rising into positive (inductive reactance) territory at frequencies above 3750 MHz, $X_s$ decreased, showing a net capacitive reactance. How can this be explained?

*Stan's Comments:*

*Coaxial cable when connected to a matching impedance (50 ohms) will not affect the apparent impedance regardless of length; however:*

*1) When connected to a non-matching impedance there will be returning currents with a +/- $X_s$.*

*2) As the current flows back it will be a "normal" sine wave changing phase until at 1 wavelength it again matches the phase of the forward wave.*

*3) RF on a coax cable does not travel the same speed as RF in free space. Specifications show this as a velocity factor (VF) which is .85 for LMR-400; this means the RF will cycle its phase over less length (1/VF wavelength). As the test frequency changes this means that the length for a full sine wave will vary being longer at 3.5 MHz and shorter at 4.0 MHz. Viewing it from a single point (like the feed point) the phase of the reflected signal will vary with frequency.*

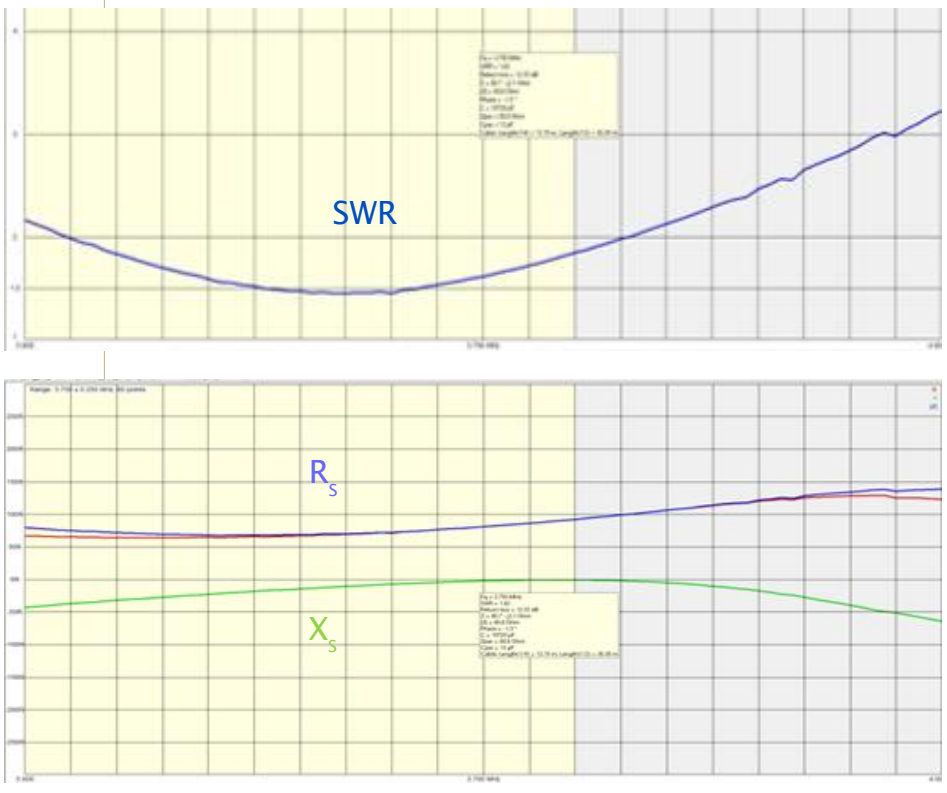
*Putting this together, a reflected signal starting at the antenna connection will be out-of-phase with the forward signal (The +/- $X_s$ as you measured at the antenna). As that reflected signal moves down the cable its relationship to the forward signal will change, starting at (for example) a +ve phase that will shift to in-phase, then -ve phase, to in-phase, then back to the +ve.*

Depending how long your cable is (in wavelengths times VF) the reflected signal will appear + or - phase ($X_s$) and at places exactly in phase with the signal going the other way. This combination is what your analyzer will see. In your image the transformer effect of the length of LMR-400 modifies what is seen.

Another effect of coax transformer effect will be, when the antenna has a high SWR, artificial dips in APPARENT SWR appear; these artificial SWR dips appear when the forward signal is cancelled out by the reverse signal with a resulting $X_s$=0. This cancellation effect is frequency dependent so a long coax may show several artificial dips typically 5-10Mhz apart.

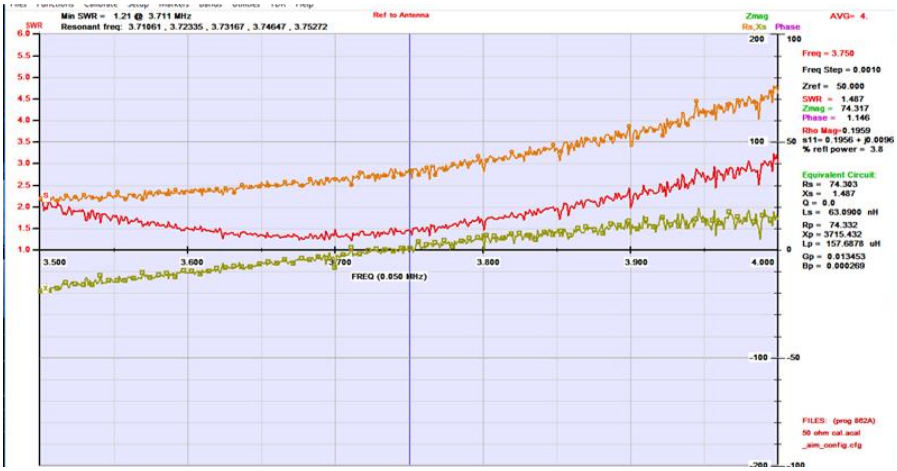
Accepted practice is to have feed lines that are ½ wavelength (after applying the VF) but only when attempting to measure at-antenna SWR. They will NOT appear if the antenna is low SWR as there is no reflected signal to mix with the transmitted one. This will not eliminate the artificial dips as the length will not be a ½ wavelength across all those frequencies. This also explains why an antenna that will not tune, may tune if a short length of coax is added between tuner/transmitter and the antenna.

Continuing with measurements at the station end of the transmission line using the RigExpert AA-600, both the SWR and $R_s$-$X_s$ graphs now agreed fairly closely with the results for the AIM 4170. *[below]*




Next using the MFJ 269, the behaviour was once again erratic, with no minimum SWR discernable at any frequency and no meaningful SWR measurable.

I took one further step when I noted that with the AIM 4170 instrument, conditions at the antenna can be measured from the far end of the feedline, if its length, velocity factor and matched loss are known. As per the Times Microwave specs for LMR-400 giving a velocity factor of 0.84 and matched loss of 0.1 dB/100 ft. (at 1 MHz), the total length of the cable was known to be 112 ft. Under these conditions, a "refer to antenna" set of curves measured from the transmitter end of the coax looked like the following. It was reassuring to note that these curves were virtually identical to those obtained when the measurements were made right at the antenna.




*Stan's Comments:*

*The AIM is calculating the coax length effect and applying it to the reflected signal. Smart!*

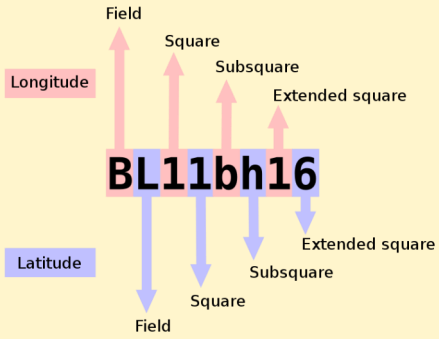
### *Conclusions:*

1. On the assumption that strong signals in the AM band (not sufficiently filtered out by the instrument) were the cause of anomalous results, the MFJ 269 readings were rendered useless.
2. The AIM 4170 analyzer appeared to be influenced by the strong off-band signals, but considerably less so than the MFJ.
3. Only the RigExpert AA-600 appeared to be immune to the strong AM signals, and give relatively consistent results at both locations of measurement.
4. When adjusting for resonance of the antenna/feedline combination, conditions at the station end of the feedline would appear to be the place that counts, as presence of the feedline will influence the resultant impedance seen by the transmitter.

## *About Maidenhead Grid Squares*

This edition of The Communicator focusses on satellite work. You will frequently find the term 'Grid Square' used. The Maidenhead Grid Square Locator System also QTH or QRA grid system is a geographic co-ordinate system used by amateur radio operators to succinctly describe their locations. Its purpose is to be concise, accurate and robust in the face of interference and adverse transmission conditions. The Maidenhead Locator System can describe locations anywhere in the world, and replaced the previous QRA locator system which was limited to European contacts. The "squares" are distorted on any non-equirectangular cartographic projection. *(see map page 28-29)*

Dr. John Morris G4ANB originally devised the system and it was adopted at a meeting of the VHF Working Group in Maidenhead, England in 1980.



# Tidbits From The Amateur Radio World

## *AO-92—A New FM Satellite Commissioned*

On the 03:25 UTC pass on January 26, 2018, AMSAT Vice President Engineering Jerry Buxton, N0JY, announced that AO-92 had been commissioned and formally turned the satellite over to AMSAT Operations. AMSAT Vice President – Operations Drew Glasbrenner, KO4MA, then declared that AO-92 was now open for amateur use.

Initially, the UHF/VHF FM transponder will be open continuously for a period of one week. After the first week, operations will be scheduled between the U/V FM transponder, L-Band Downshifter, Virginia Tech Camera, and the University of Iowa's High Energy Radiation CubeSat Instrument (HERCI).

Schedule updates will appear in the AMSAT News Service Weekly Bulletins and will also be posted to the AMSAT-BB, AMSAT's Twitter account (@AMSAT), the AMSAT North America Facebook group, and the AMSAT website at https://www.amsat.org/satellite-schedules/

AO-92 was launched on the PSLV-C40 mission from Satish Dhawan Space Centre in Sriharikota, India on January 12, 2018. For the past two weeks, the AMSAT Engineering and Operations teams have been testing the various modes and experiments on board. Testing has shown that both the U/v FM transponder and L-Band Downshifter work very well. The Virginia Tech camera has returned stunning photos and data from HERCI has been successfully downlinked.

AMSAT thanks the 178 stations worldwide that have used FoxTelem to collect telemetry and experiment data from AO-92 during the commissioning process. The collection of this data is crucial to the missions of AMSAT's Fox-1 satellites. Please continue to collect data from AO-85, AO-91, and AO-92.

The L-band experiment will use 1267.350 MHz uplink with 145.880 MHz downlink. UHF and L-band uplink operation are set by the command stations; the operating schedule will be posted.

AMSAT Bulletin Board http://www.amsat.org/mailman/listinfo/amsat-bb

N2YO online real-time satellite tracking http://www.n2yo.com/

AMSAT-NA online orbital predictions http://www.amsat.org/track/

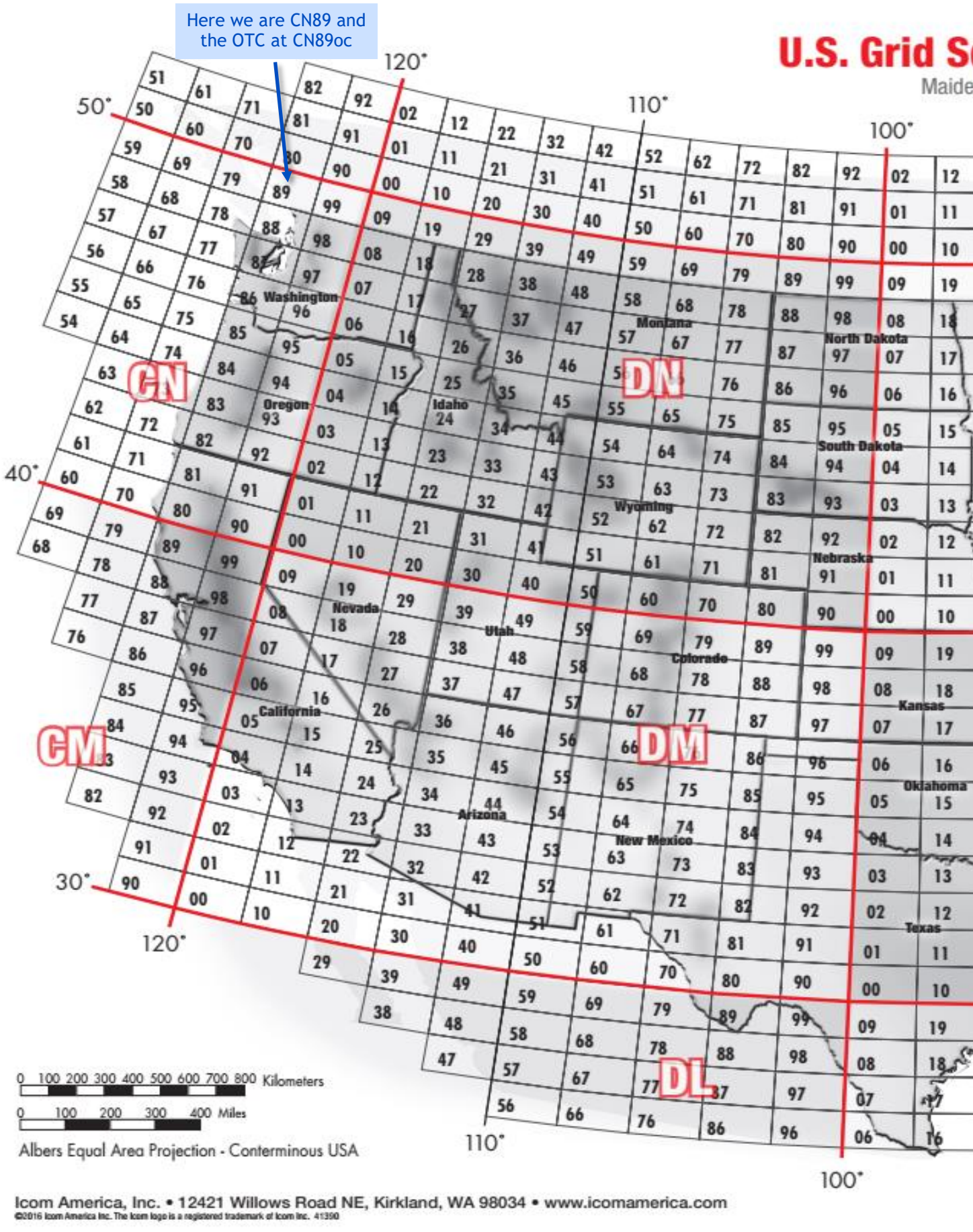
Keplerian Two Line Elements (TLEs) 'Keps' for new satellites launched in past 30 days http://celestrak.com/NORAD/elements/tle-new.txt

Adding new satellites to SatPC32, Gpredict and Nova https://amsat-uk.org/2013/11/23/adding-new-satellites-to-satpc32/

### Radio Programming Chart

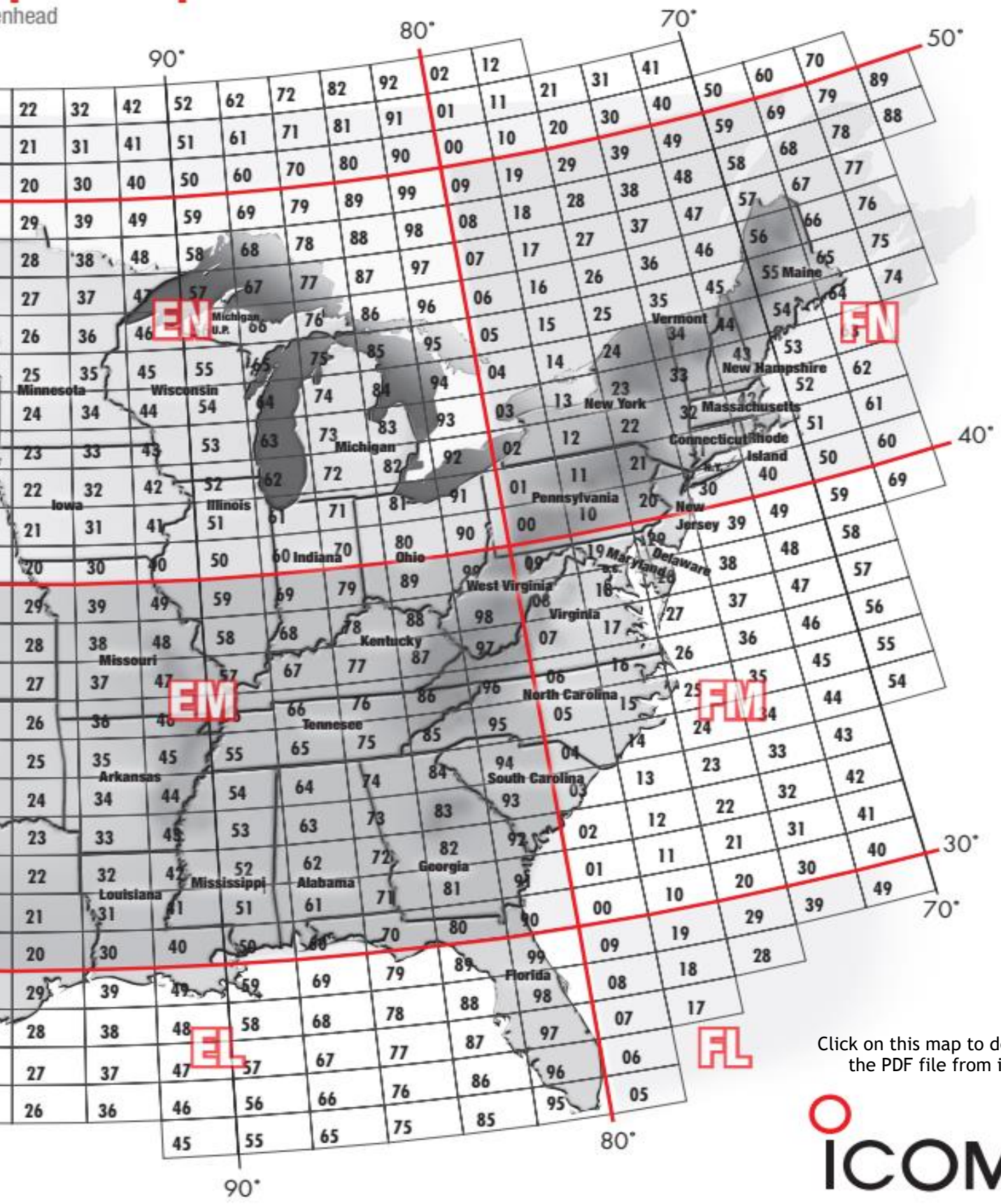
#### Fox-1D Doppler Shift Correction

**Memory 1**
(AOS) – TX 435.340 MHz (67.0 Hz Tone), RX 145.880 MHz
**Memory 2**
(Rise) – TX 435.345 MHz (67.0 Hz Tone), RX 145.880 MHz
**Memory 3**
(TCA) – TX 435.350 MHz (67.0 Hz Tone), RX 145.880 MHz
**Memory 4**
(Descend) – TX 435.355 MHz (67.0 Hz Tone), RX 145.880 MHz
**Memory 5**
(LOS) – TX 435.360 MHz (67.0 Hz Tone), RX 145.880 MHz



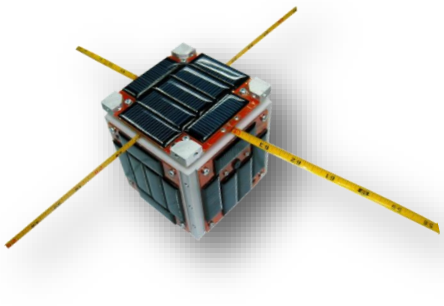
# quare Map

enhead




Click on this map to download the PDF file from iCom

ICOM



# Satellite Experiences

Patrick Stoddard, WD9EWK/VA7EWK

## *A Satellite Road Trip Around BC*

Ever since I started working the amateur satellites, I enjoyed the thought of operating away from home. My first opportunities for this were in 2006, on trips to Dayton and the AMSAT Symposium in San Francisco. Starting in 2007, I took road trips to different locations (and different grids) around Arizona. During the summers of 2008 and 2009, I took road trips around northern Arizona and neighboring states.

As I went to these places, I operated satellites from wherever I happened to be. Many of the grids I stopped in are rarely heard on the satellites. For my 2010 summer vacation, I decided to do another road trip, but not in the southwestern USA. I decided that the road trip would be around British Columbia in Canada, on the Lower Mainland as well as nearby Vancouver Island. I also planned to work satellites in SSB as well as FM on this trip; I only worked FM on the 2008 and 2009 road trips. I drove over 3000km (almost 1900 miles), operated from 9 different grid locators including one grid boundary and an international boundary, and logged almost 400 satellite QSOs.

AO-7 had started a period of constant illumination, meaning I could use that satellite every other day in mode B. HO-68 was in FM for the week of 4-10 July. This turned out to be a great satellite for this trip, giving more opportunities for FM satellite QSOs with VA7EWK from several different grid locators.

For hams from the USA and many other countries, Canada is a simple place to operate from. Canada recognizes US amateur licenses and participates in the CEPT and IARP licensing schemes. Hams from other countries not covered by CEPT or IARP can request a temporary permit from Industry Canada. After making many trips to Vancouver in the late 1990s and early 2000s, I wrote the exams to obtain a Canadian amateur certificate in 2002 and received my VA7EWK call sign. More information about the Canadian amateur service is available online from the licensing authority, Industry Canada. Additional information about amateur radio in Canada is available from the national organization, Radio Amateurs of Canada.

I booked a round-trip ticket for my flights between Phoenix and Vancouver, leaving Phoenix on 3 July 2010 and returning on 11 July. This would give me a full week in Canada, plus parts of two other days. I planned to split my trip into 2 parts – the first 4 full days on Vancouver Island, then the remainder of the trip in and around Vancouver. This turned out to be a perfect plan. I would have time to see the sights, take pictures, and work the radios. I brought a few radios on the trip: for FM, an Icom IC-T7H 2m/70cm HT and an Icom IC-2820H 2m/70cm mobile radio; for SSB, a pair of Yaesu FT-817NDs. Antennas used on this trip were an Elk Antennas handheld 2m/70cm log periodic and a Smiley Antenna 2m/70cm telescoping whip for the HT. This is my normal portable satellite station, so I was confident I could have success operating from wherever I happened to stop in Canada.

The radios and accessories that were not banned from carry-on baggage went in a large laptop bag. The log periodic antenna and everything else for my radios went in a large duffel bag I used for my clothes, which was checked in at the ticket counter for the flights.

After arriving at Vancouver airport and clearing Customs on Saturday (3 July) afternoon, I

rented a car – a Chrysler PT Cruiser. The PT Cruiser was larger than I needed, but it allowed me extra space to store radio equipment and quickly assemble it to work the satellites when on the road.

I could leave my log periodic sitting fully assembled in the back of the car. I spent a couple of hours in and around Vancouver for lunch and some time to ensure all of my radio equipment survived the flight before taking a ferry over to Vancouver Island. I also decided to try out the radios on some satellite passes in the late afternoon from the Vancouver area, in grid CN89.

I found 3 passes in the span of an hour starting around 1745 local time (0045 UTC) – AO-51, FO-29, then AO-7 in mode B. I worked all 3, logging 13 QSOs on AO-51, 7 on AO-7, then 4 more on FO-29. After those passes, I packed the radios up for the drive across Vancouver to Horseshoe Bay, the ferry terminal I would use to get to Nanaimo on Vancouver Island. The ferry ride was 90 minutes, followed by a 90-minute drive from Nanaimo up Highway 19 to the city of Campbell River, at the CN79/CO70 grid boundary (50° North) where I would spend he next 3 nights. I arrived at the motel just before 0100 local time (0800 UTC), and quickly went to bed.

While on Vancouver Island for 4 days, I operated from 5 different grids. I started out on Sunday (4 July) at a spot on the 50th parallel near my hotel in Campbell River, on the CN79/CO70 grid boundary. On Monday (5 July), I drove to Port Hardy on the north end of the island in grid CO60. I had tried to find a spot on the northwest corner of the island in grid CO50, but the mountains in that area made that a bad option, so I spent most of the day along the waterfront in Port Hardy working many passes. After checking out of my motel in Campbell River on Tuesday (6 July) morning and working one more AO-7 pass at the CN79/CO70 grid boundary, I drove west toward the Pacific side of Vancouver Island. With one stop at Port Alberni, about 1/3 of the way to the

island's west coast where I worked an HO-68 pass, I made it to Ucluelet on the coast in grid CN78 just in time for an AO-27 pass at 1255 local time (1955 UTC). I worked many passes in FM and SSB until the early evening, and drove back to Port Alberni for the night.

On Wednesday (7 July), I drove down to Victoria (grid CN88) on the south end of the island. I operated from two locations outside Victoria during the morning, and more passes around midday from the Mile 0 monument – the western end of the Trans-Canada Highway, where I could look across the water to the south and see Washington state.

After the operating and walking around the center of Victoria, I drove north to the Swartz Bay ferry terminal and the M/V Spirit of Vancouver Island for a 95-minute ride to the Tsawwassen ferry terminal south of Vancouver. About halfway through the ride, around 2245 UTC, there was an AO-27 pass.

I decided to try working this pass with my IC-T7H HT and a telescoping whip, instead of using my log periodic and attracting too much attention from the ferry crew. I only heard the satellite for about 3 minutes, and logged 2 QSOs while sailing through grid CN88hu and some small islands near Vancouver Island. Thanks to Jeff K7WIN (now K2AK) and Sawson KG6NUB for hearing me and being patient as I asked for repeats to complete these QSOs. The 7-minute timer expired as I attempted to log a QSO with Dale KL7XJ. These were my frst QSOs from a ship, and I gained an appreciation for what satellite operators like Allen N5AFV, Andy W5ACM, and others have done on many cruises and ships.


After the ferry ride, I drove to my motel in Vancouver. The thermometer in the PT Cruiser showed the afternoon temperature in Vancouver at 36˚C (96˚F). This was not as warm as I would have experienced back in Phoenix, but was warm with the humidity that I don't normally see back home. I decided to take a break from the radio for the evening. I had dinner at a nearby restaurant, then drove across to Burnaby and visited with John VE7JRX – a long-time Vancouver satellite operator.

I had some plans already made for Thursday (8 July) in and around Vancouver. I wanted to do some sightseeing south of the city, including the Peace Arch Park3 at the Canada/USA border. I was also planning to attend a meeting of the North Shore Amateur Radio Club in North Vancouver in the evening. I decided to do some operating on a few passes from Surrey, a suburb south of Vancouver, in the morning and early afternoon. I found a parking lot near Highway 99, the freeway from Vancouver to the border and the northern end of Interstate 5, and worked 4 passes. On 2 HO-68 passes, an AO-7 pass, and an AO-27 pass, I logged 19 QSOs before moving on to White Rock and then Peace Arch Park.

Before this trip, I thought about the possibility of operating from the Canada/ USA border. Standing on the border is generally not permitted, but it is encouraged at Peace Arch Park. This park is actually two parks - a British Columbia provincial park and a Washington state park, divided by the international border. Through the middle of the park are border markers to the west and east of the arch. Within the park, it is legal to cross the border without any border formalities, provided you leave from the side of the park you entered. I took my HT, log periodic, and a camera from my car and walked to the arch. I took some pictures, and then identified the spot I would operate from – next to one of the border markers west of the arch and the southbound lanes of the highway running through the park (British Columbia Highway 99 to the north of the arch, and Interstate 5 to the south).

Due to the technology of the day when the border markers were established, none of them at Peace Arch Park are situated on 49˚ North, which is defined as the border by treaty. The 49˚ North line was actually at the US Customs building on the south end of the park. In the park, the border is just north of the CN88/CN89 grid boundary. I operated from grid CN89oa at that border marker, standing with one foot on each side of the border, and identifying my station as VA7EWK and WD9EWK. I worked two passes from here – a west-coast AO-27 pass around 2217 UTC, followed by an eastern AO-51 pass at 2307 UTC. I logged 6 QSOs on AO-27, and 10 QSOs on AO-51. I printed special QSL cards for the QSOs made at this location; a VA7EWK QSL card on one side, and a WD9EWK QSL card on the other side.

Both sides of the card had the same QSO information, and identifying the location at each side of the border marker (Surrey, British Columbia; Blaine, Washington, in Whatcom County).

Friday (9 July) morning started early. I wanted to drive up to Whistler, the ski resort about 2 hours north of Vancouver, where I hoped to operate from grid CO80. Once again, mountains and trees complicated my plans for satellite operating. I drove near the heliport north of Whistler Village at grid CO80ne for an HO-68 pass at 1643 UTC, and worked 8 stations in 5 minutes. This was not a great place to work satellites, as I only could see 1/3 of the HO-68 pass. I drove around more, scouting out other locations to work from, but missing other passes I could have worked. I grabbed some lunch, and took a long clockwise drive around the southwestern corner of British Columbia, something I had not planned on doing before this trip. I was able to work from two other locations in CO80 on later AO-27 passes – one overlooking Alta

Lake west of Whistler Village in grid CO80me (6 QSOs in the 3 minutes I could hear AO-27), and the other northeast of Pemberton along Highway 99 in grid CO80tj (9 QSOs). I kept driving up the highway, and then started working my way south back toward Vancouver on Highway 12 and the Trans-Canada Highway.

I stopped in two other grids for passes in the late afternoon. I stopped along Highway 12 north of the Trans-Canada Highway and the town of Lytton for one AO-51 pass just after midnight UTC in grid CO90eg. This would be my only operating from grid CO90, and it was a good pass. Twenty stations went in the log here, from all over the continental USA and Alaska. After this pass, I drove about 30 minutes to a spot just into grid CN99 along the Trans-Canada Highway. I worked 3 passes from grid CN99gx in the town of Boothroyd – AO-7, FO-29, and AO-51 – in the span of an hour. Twelve more QSOs went in the log. I stopped at another point along the Trans-Canada Highway north of the town of Hope for an FO-29 pass around 0300 UTC, but logged no QSOs there. After a dinner break in Hope, I drove back to Vancouver for the night on the Trans-Canada Highway and planned a return to Whistler.

I covered over 670km (416 miles) in this loop around British Columbia, along with operating from 3 different grids.

Saturday (10 July) morning came, and I wanted to make another try at operating from Whistler. The spot I stopped at near Alta Lake was the best spot I saw near Whistler Village, and went there for an SO-50 pass followed by an HO-68 pass around 1615 UTC. I logged 5 QSOs on SO-50, then 13 more on HO-68. This was a good spot, but I wanted a better operating location. I saw one, and decided to try for it. I packed my HT, log periodic, GPS, and a camera in a small duffel bag, then took the gondola to the top of Whistler Mountain. In the summertime, one can walk around the mountaintop, or use the ski runs for jogging and mountain bike riding. I was interested in sightseeing, plus riding the PEAK-2-PEAK gondola between the tops of the two main ski mountains here, Whistler Mountain and Blackcomb Mountain. Before seeing the top of Blackcomb Mountain, I wanted to fnd a good spot on Whistler Mountain to operate from. I used an observation deck on the Roundhouse

| ***QSOs on FM Satellites*** | |
|---|---|
| AO-27 | 97 |
| AO-51 | 112 |
| HO-68 | 74 |
| SO-50 | 48 |
| 84.2% of all QSOs - Total 331 | |

| ***QSOs on SSB/CW Satellites*** | |
|---|---|
| AO-7 | SSB - 30; CW - 2 |
| FO-29 | SSB - 23 |
| VO-52 | SSB - 7 |
| SO-50 | 48 |
| 15.8% of all QSOs - Total 62 | |

| ***QSOs by Grid*** | |
|---|---|
| CN78 - Ucluelet on Vancouver Island | 56 |
| CN79 - Port Alberni on Vancouver Island | 21 |
| CN79/CO70 - Campbell River on Vancouver Island | 85 |
| CN88 - Around Victoria and the Ferry | 25 |
| CN89 - Around Vancouver, including Canadian/USA Border | 59 |
| CN99 - North of Lytton, north of Vancouver | 12 |
| CO60 - Port Hardy on Vancouver Island | 61 |
| CO80 - Around Whistler, B.C. | 54 |
| CO90 - Boothroyd, northeast of Vancouver | 20 |

building at Whistler Mountain, at 1850m (6069 feet) elevation in grid CO80ma, and had no problems from here. I worked an SO-50 pass at 1755 UTC covering the Pacific coast, logging 5 QSOs. The next SO-50 pass at 1935 UTC yielded one QSO with Dale KL7XJ in Alaska, and then an AO-27 pass started just after that. I could hear the last 3 minutes of the 7-minute pass, but I could not get a signal through. I had been exchanging e-mails, text messages, and phone calls with Drew KO4MA, all in the hopes of making a QSO with him from grid CO80 while I was in this area. I told Drew I would try to work him first, and then work anyone else I could in the remaining time. I heard Drew call me with less than a minute to go on the AO-27 pass, and then I was able to get through to make a call back to him. We were able to make the QSO with about 10 seconds to spare, and this was my only QSO on the pass. Before the next AO-27 pass, I took the PEAK-2-PEAK gondola over to Blackcomb Mountain, walked around and took pictures, then crossed back to Whistler Mountain in time for the AO-27 pass at 2120 UTC. I logged 6 QSOs on this pass, which was the final pass I worked for this trip.

After taking pictures of the different 2010 Winter Olympics venues in and around Whistler, I returned to my hotel in Vancouver for my final night in Canada.

On Sunday (11 July), I did some sightseeing around downtown Vancouver including Stanley Park, before going to Vancouver airport. When I returned the car to the rental-car agency at the airport, the receipt showed that I traveled 3024km (1879 miles). I checked in at the ticket counter, went through the airport security and US Customs checkpoints, and then flew home to wrap up this trip.

For this trip, I made 393 QSOs from 9 different grids – 5 on Vancouver Island (CN78, CN79, CN88, CO60, and CO70), and 4 on the Lower Mainland (CN89, CN99, CO80, and CO90). Here is a breakdown by mode and satellite, and by grid. Despite being so far north and not having all of the 7-minute repeater time on AO-27 passes, that satellite worked well for me. During this week. Having HO-68 in FM for this week was a nice bonus. I was impressed with how well I was able to work AO-7 and FO-29, and those larger footprints helped in getting other operators some of these rarely heard grids. Since the VO-52 passes were very close to the HO-68 passes, I ended up only working one VO-52 pass on this trip. I enjoy working VO-52, but HO-68's higher orbit and mode for this week (FM) made that the obvious choice for passes in the mid-morning hours.

Thanks to John K8YSE5 for his assistance during this trip. He would be available via phone and e-mail to answer questions or look up information while I was traveling, and posted some messages to the AMSATBB list when I was not able to do so myself. John has done his share of road trips working satellites, along with other trips working HF from locations around the world. He has a wealth of information I could lean on. And a thank-you to all the satellite operators that made QSOs with VA7EWK during this trip.

*~ Patrick WD9EWK/VA7EWK*
*YouTube Channel & Website*

*This article originally appeared in the AMSAT Journal. It is reprinted here with the author's permission.*

Notes:

1. Industry Canada (Now Innovation, Science and Economic Development Canada): http://strategis.ic.gc.ca/radioamateur.e
2. Radio Amateurs of Canada: http://www.rac.ca/
3. Peace Arch Park: http://www.peacearchpark.org/
4. North Shore Amateur Radio Club (North Vancouver, BC): http://www.nsarc.ca/
5. John K8YSE: http://www.papays.com/sat/

# *Work FM Satellites With Your HT!*

Clint Bradford K6LCS

Many hams already have the necessary equipment to work FM amateur satellites. This guide offers a quick start for successfully “working” an FM bird. All cited resources are available to you at one Web site, Clint Bradford K6LCS’s work-sat.com

If you have 2M and 440 capabilities (either “split frequencies” in one HT, or two radios), you can work an FM amateur satellite! For example, in satellite SO-50's VHF/UHF (V/U) mode, the UPLINK frequency (to SO-50) for FM voice is 145.850 MHz*. The DOWNLINK frequency (from SO-50) is 436.795 MHz*.

First, you need to know WHEN and WHERE the satellite will be passing over your location. There are several commercial computer programs that will tell you. In the home office, I use MacDoppler. Outside, though, I use PocketSat3 on my iPod touch/iPhone. On my netbook, Nova for Windows and SatPC32 are marvelous. But free of charge info is also available online at heavens-above.com - or - amsat.org - or - N2YO.com. Log in, plug in your longitude and latitude, and you will have access to amateur satellite pass information and frequencies to program into your HT.

The one "absolute" for success is to open up your squelch. We are talking about “weak signals” from hundreds of miles away - so don't expect the satellite to be strong enough to break squelch like your local repeater. Sure, it’s a little noisy - but that's part of the process: That noise is an aid in locating the satellite. When the frequency starts exhibit quieting, that's a sign that you are capturing the satellite’s signal.

Improve your HT’s stock antenna (most are rated at NEGATIVE 6 db or worse!). For BNC connectors, Diamond’s RH-205 will make the difference. For male and female SMA - and BNC - the Smiley 270A is a good performer. But for best success, you need more GAIN, so using an Arrow Sat Antenna Yagi is much better. If you prefer to homebrew your antenna, go to the work-sat.com web site’s ANTENNAS page for construction article links.

For SO-50, set up your radio to tune for the Doppler effect on the 440 downlink. Start listening above the center frequency - you will acquire the satellite sooner and clearer. When the downlink gets scratchy or fuzzy, tune down 5KHz at a time, and reception should be clearer. Only transmit when you can clearly hear the satellite. Follow the signal down in frequency as the pass continues. The new AO-85 is a little different, with its 2M downlink and 440 uplink (see the frequency charts that follow).
Don't hold your whip antenna upright. Held in a vertical position, your transmitted signal is hitting land-based receivers. You need to tilt your HT’s antenna so that it is perpendicular to the airborne satellite. Very few of the ham satellites are land-based (grin), so you must TILT your antenna about the same amount as the satellite's ELEVATION. You’ll quickly get the hang of it—and hear the difference! You’ll have best results with a modest beam or Yagi.

Ideally, we should be working the satellites in full duplex mode, where we can simultaneously listen to the downlink as we are transmitting. Although this method is preferred, it is not mandatory: Carefully monitor the downlink, and wait for a break in the conversations to announce yourself. You might find it helpful to record your sessions for later review. Even if you don’t make a contact during a pass, a recording can help you recognize the callsigns and voices of other operators. Pocket recorders or smartphone apps are great for this. If working full-duplex, use an earpiece or headphones to monitor the downlink and avoid acoustic feedback.

Knowing your grid square - and having a grid square map - is a quick way of identifying locations of what you will hear. The ARRL and Icom have grid square maps: Icom’s is free and available at better ham radio stores.

It just takes a little preparation and planning for working amateur satellites. Not every pass is workable with an HT — don't go after the sub-10° elevation passes as you start “working the birds.” Choose your

passes wisely: Working higher elevation passes will give you better results. When you clearly hear others, listen for a break in the action, and use the ITU approved phonetic to announce your callsign, grid square, and op mode:

"KILO-SIX-LIMA-CHARLIE-SIERRA, DELTA-MIKE - ONE-THREE, handheld."

Check work-sat.com for the satellites' home Web pages – to make sure the sat is in the mode you can work with your setup!

Is there anything else up and running right now? There's AO-85, AO-91, AO-92, AO-7, FO-29 (JAS-2), and others with SSB/CW transponders on board. AO-73 FUNcube-1 is "fun" to work! Info on these on the SAT SKEDS page at work-sat.com.


*Clint demonstrates his satellite techniques*

### *About Clint*

*You do not need 100W of transmit power nor expensive antenna arrays to work FM amateur satellites! Many hams already have the necessary equipment to "work the birds." This presentation will walk you through ALL the steps needed to successfully work several ham satellites.*

*Clint Bradford K6LCS has orchestrated an ARISS contact - where students spoke to an astronaut who was aboard the ISS at the time! Clint still performs activities as a liaison between NASA, the ARISS team, and schools coordinating amateur radio contacts with the International Space Station.*

*Clint is a registered ARRL Educator, and benefits of AMSAT and ARRL memberships are covered in the presentation. Professionally, he has worked both the commercial side (for Motorola) and the amateur side (HRO) of the two-way radio industry. This presentation will be his 96th on the topic - and NO ONE has fallen asleep in one yet! Clint not only educates but also entertains: Chances are you'll win a "trivia question" prize before the show is over!*

## *Clint's Satellite Presentation Comes To Surrey, BC*

Mark this one on your calendar: ARRL Instructor and Legacy Circle Club member Clint Bradford, K6LCS, will be giving his satellite presentation at the Surrey (BC) Amateur Radio Club on March 14, 2018. All are welcome to attend.

"The club has been serving their region well since 1975," Clint writes. "I am honoured you have asked me to speak."

The meeting is held at the Emergency Management BC, South West Provincial Regional Emergency Operations Centre, 14292 Green Timbers Way, Surrey BC, at 7:00 PM. For more information visit SARC's Web site at: http://ve7sar.net/

Attendees will be shown EVERYTHING needed to work the FM voice ham satellites – with a re-occurring theme of, "Most hams already have most of the necessary equipment… " Attendees can download a four-page tutorial beforehand at: http://www.work-sat.com …and Clint welcomes pre-presentation questions. Call him at 909-999-SATS (909-999-7287), or send email to k6lcs@ham-sat.info

NOT in the Southern California region, but believe an hour-long, customized-to-your-club satellite presentation would be appreciated by your club? Send Clint a message: He will prepare the PowerPoint/Keynote for you, send it ahead of time along with handouts and trivia question "prizes" to hand out, and he will use Skype for audio in your meeting room!

# More Satellite News…

## *Long-Dead NASA Spacecraft Wakes Up*

*There is some local flavour to this story.*

Amateur astronomer Scott Tilley VA7LF VE7TIL, formerly from Vancouver, has a hobby: He hunts spy satellites. Using an S-band radio antenna in Roberts Creek, British Columbia, he regularly scans the skies for radio signals from classified objects orbiting Earth. Since he started 5 years ago, Tilley has bagged dozens of secret or unlisted satellites. "It's a lot of fun," he confesses..

Earlier this month, Tilley was hunting for Zuma--a secretive United States government satellite lost in a launch mishap on Jan. 8th--when a J-shaped curve appeared on his computer screen. "It was the signature of a lost satellite," he says, "but it was not Zuma."

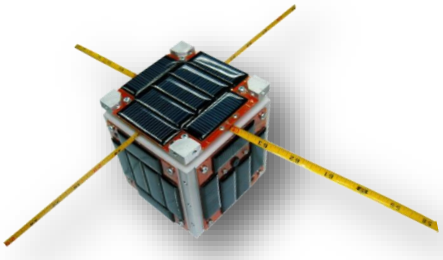
In a stroke of good luck that has dizzied space scientists, Tilley found IMAGE, a NASA spacecraft that "died" more than 10 years ago. Check http://www.spaceweather.com/.

Since Tilley's announcement, project scientists spent a couple days furiously digging up old software and records, and this weekend, NASA will attempt to contact IMAGE with its deep space radio antennas—as will the Johns Hopkins University Applied Physics Laboratory in Laurel, Maryland, and researchers at the University of California, Berkeley. Right now, the team is puzzled as to why it appears the spacecraft's rotation rate has slowed, which may make communication more challenging. "The team is collectively holding their breath waiting for some real information exchange between IMAGE and the ground.

Ed Frazer VE7EF comments, "About ten years ago, when Scott lived in Vancouver, and I was the RAC Director, I helped Scott deal with the city of Vancouver who demanded that Scott remove his ham radio antennas. Eventually, the City gave up. In that time, I had Scott speak to NSARC on his VLF experiments. He was an amazing operator in VLF and astronomy. He moved to the Sunshine Coast to buy some acreage in the bush where RF noise was minimal."

*IMAGE during testing at a Lockheed-Martin facility. Credit: NASA*


*A Gildersleeve cartoon, reproduced with permission from ARRL ~ October 1955*



# More Satellite News

Daniel Romila VE7LCG

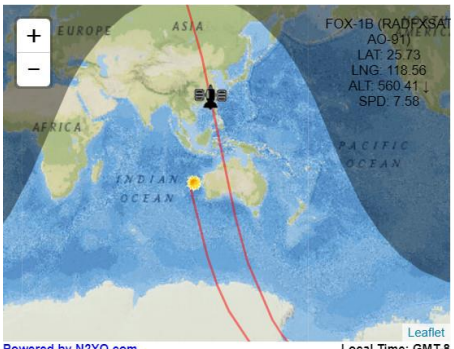
## *Tracking Ham Radio Satellites With AMSAT*

### *Introduction*

It was January 1st, 2018, just several minutes before 1 o'clock in the afternoon. I was browsing through the articles of the last magazine, the first number from 2018. I stopped at the article about the new satellite launched in November 2017, AO-91 operating on 145.960 MHz. I punched the numbers into an old Kenwood 7900 FM transceiver – more precisely, a 34 years old transceiver that I got free, and I fixed the missing tones. It uses a whip antenna on the balcony.

### *And AO-91 hit me in the face*

I did not know what I was receiving. I should mention I am in Coquitlam, at 130 meters above the sea level, clear view towards South. Very skeptically, I Googled for "AO-91 tracking" and the first result was the page of N2YO (www.n2yo.com). I was still shocked, so I was unable at that moment to save any info from that page. It showed, in real time, AO-91 coming from the South/California and hitting me directly in the face. What I saw on the screen was similar with the situation now, January 1st, around 9 o'clock in the evening.




Powered by N2YO.com Local Time: GMT-8

NEXT PASS OF FOX-1B (RADFXSAT AO-91) OVER YOUR CURRENT LOCATION

| START AZIMUTH | | MAX ELEVATION | | END AZIMUTH | | TOTAL DURATION |
|---|---|---|---|---|---|---|
| Jan 2 00:43 | 33° NE | 00:47 | 13° | 00:52 | 150° SSE | 09m 35s |

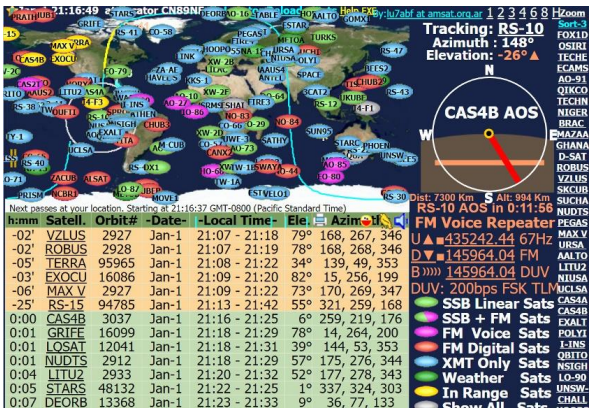
### *Tracking satellites – A Practical 'How To'*

Excited about hearing a satellite, I wanted more. I wanted to be able to predict when AO-91 and other satellites were workable, or at least that I would be able to hear them. I'll skip the part about installing all kind of programs that were not updated since 2001 and do not contain the new satellites.

Best is to go directly to:

http://amsat.org.ar/pass#top

You will see the overwhelming image on the screen:




This is not so useful. In the right hand corner we can select to see less information, not for all satellites. We can choose, for example, to see only the FM voice satellites. By clicking "FM Voice Sats" it will become underlined:

The map on the screen will become less crowded:

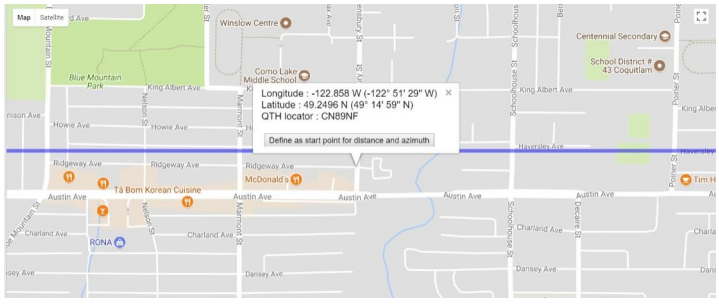

Now, that the information on the screen is more manageable, we can verify if the date, hour and location on the left upper corner is correct for your location. Most probably it is not.

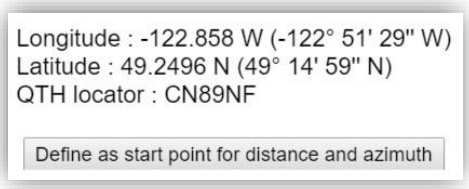
So, you need to set your location. Click LOCATOR:


It will show you something like:

| Check or change your Station Grid Locator or Latitude/Longitude | | | | | | | | Grid? |
|---|---|---|---|---|---|---|---|---|
| Google Map | Locator: | GF05SK | Reset | Resolve and Set New | | | | |
| +North -South => | Latitude: | -34.5696 | Deg. | -34.0000 | Min. | 34.0000 | Sec. | 11.0000 |
| +East -West => | Longitude: | -58.4581 | Deg. | -58.0000 | Min. | 27.0000 | Sec. | 29.0000 |

Click in the upper right corner GRID. A web page will open, with a world map. It is slow. Have patience. Increase the zoom, decrease the zoom if needed, and finally click on your location. You will have on the screen:




It would be nice if the button “Define as start point for distance and azimuth” would work, but it does not.

So you have to go back in the original satellites tracking page, and click LOCATOR:


Now you can click RESET, in the new screen:

| Check or change your Station Grid Locator or Latitude/Longitude | | | | | | | | Grid? |
|---|---|---|---|---|---|---|---|---|
| Google Map | Locator: | GF05SK | Reset | Resolve and Set New | | | | |
| +North -South => | Latitude: | -34.5696 | Deg. | -34.0000 | Min. | 34.0000 | Sec. | 11.0000 |
| +East -West => | Longitude: | -58.4581 | Deg. | -58.0000 | Min. | 27.0000 | Sec. | 29.0000 |

You need to manually introduce at least the locator:

| Check or change your Station Grid Locator or Latitude/Longitude | | | | | | | | Grid? |
|---|---|---|---|---|---|---|---|---|
| | °.ddd Locator: | | Reset | Resolve and Set New | | | | |
| +North -South => | Latitude: | | Deg. | | Min. | | Sec. | |
| +East -West => | Longitude: | | Deg. | | Min. | | Sec. | |

| Check or change your Station Grid Locator or Latitude/Longitude | | | | | | | | Grid? |
|---|---|---|---|---|---|---|---|---|
| | °.ddd Locator: | CN89NF | Reset | Resolve and Set New | | | | |
| +North -South => | Latitude: | | Deg. | | Min. | | Sec. | |
| +East -West => | Longitude: | | Deg. | | Min. | | Sec. | |

After you typed the locator, click with the mouse in the empty box under, otherwise it will lose the locator again! Now click RESOLVE AND SET NEW.

### *Finished! You are done!*

The above information is enough to make you started with satellites. There is a lot of information to discover in the page we were talking about, http://amsat.org.ar/pass#top

Some definitions:

Satellite elevation: It is an up down angle. It is the angle between your hand pointing towards the satellite in the sky, and the horizon line in your location.

Satellite azimuth: It is a side to side angle. In order to be able to point with your hand towards the satellite you need to rotate all your body first, left and right (East, West and so on). That is the azimuth angle. By definition North is 0 degrees, East is 90 degrees, South is 180 degrees and West is 270 degrees. North can also be called 360 degrees.

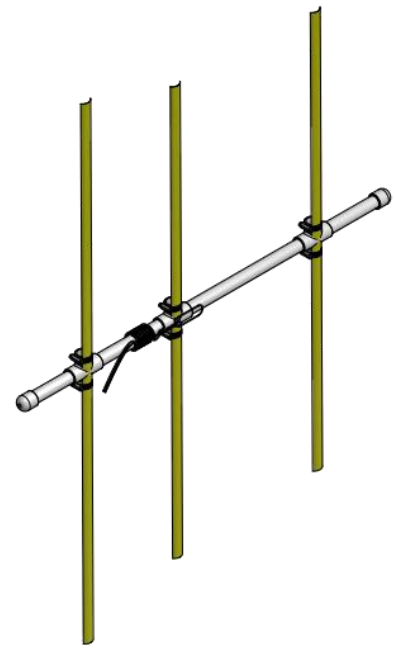
*~ Daniel Romila VE7LCG*

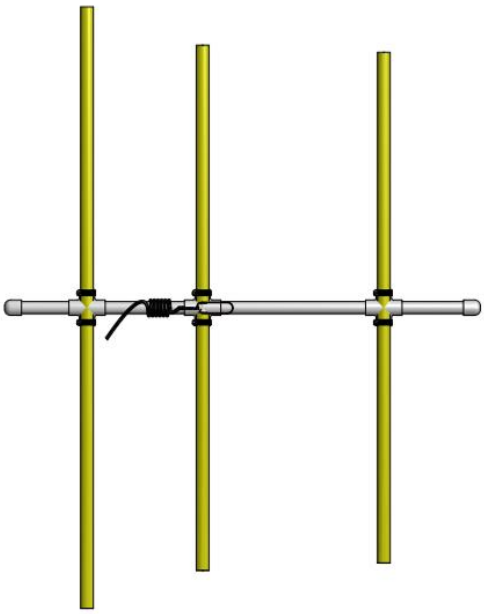
# Antenna Adventures

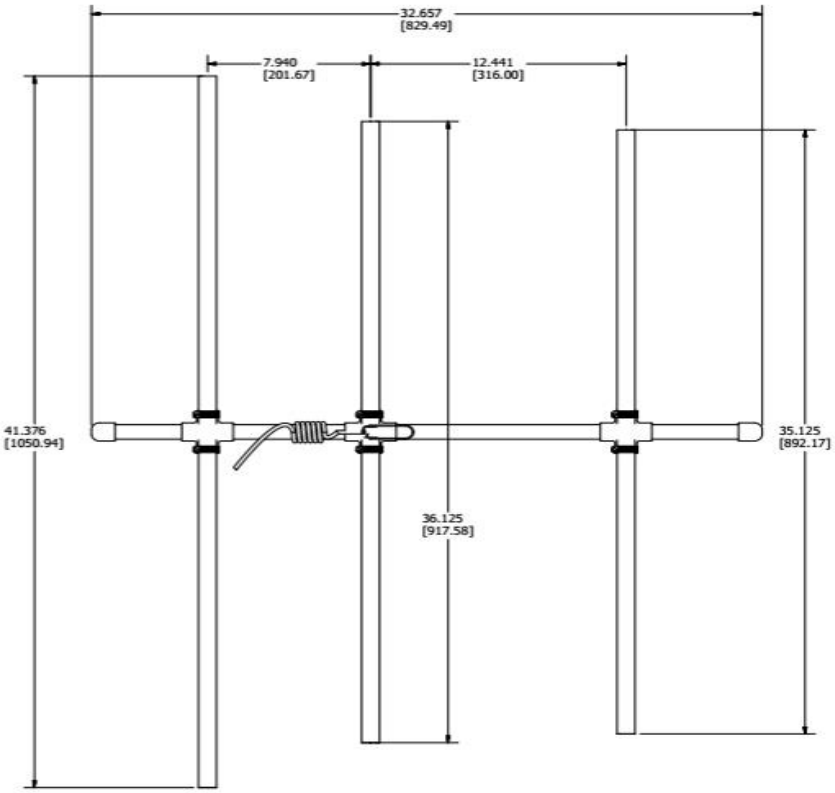
Jeffrey Bail NT1K

## *3 Element Tape Measure Yagi*

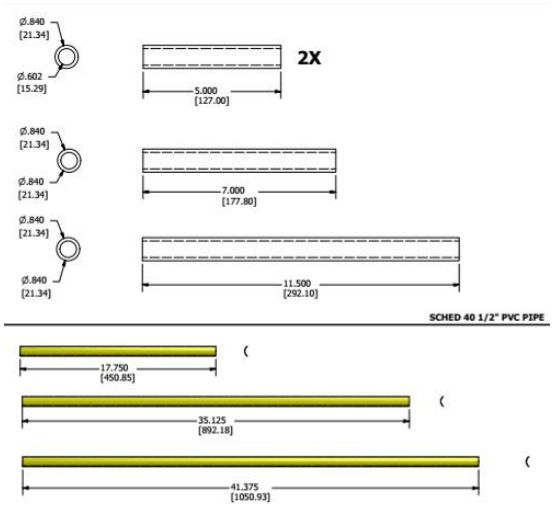
This project produces a simple yet effective 3-element 2-meter Yagi directional antenna that could be used for direction finding (Fox Hunting), SOTA, emergency communications and other things that need an improved antenna for tour handheld transceiver compared to its stock antenna.

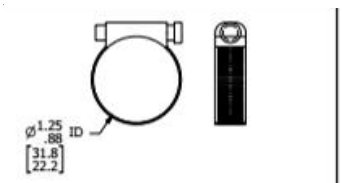


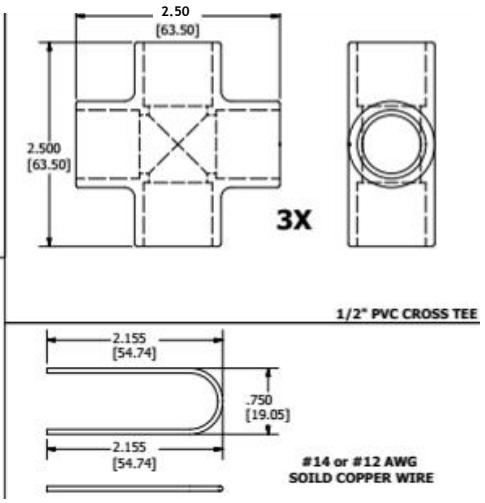





ALL DIMENSIONS SUBJECT TO CHANGE
VARIES DEPENDING ON MFG




## Parts List

- Approx 3ft 1/2" Sched 40 PVC Pipe
- 2 PVC NON-Threaded Caps (1/2")
- 3 PVC Cross Tee
- 1" Wide Tape Measure (At least 10' Long)
- Variable Length of RG-58 Coax Cable
- 6 Stainless Steel Hose Clamps (Adjustable from 7/8 - 1-1/4" or Near)
- 5" of #14 or #12 AWG Soild (Non Stranded) Wire
- Solder
- Sand Paper (Between 60-120 Grit)
- (Optional) Dremel/Rotary Tool with Sanding/Grinding Bit
- Electrical Tape
- PVC Primer / PVC Glue (Optional)

## Tools List

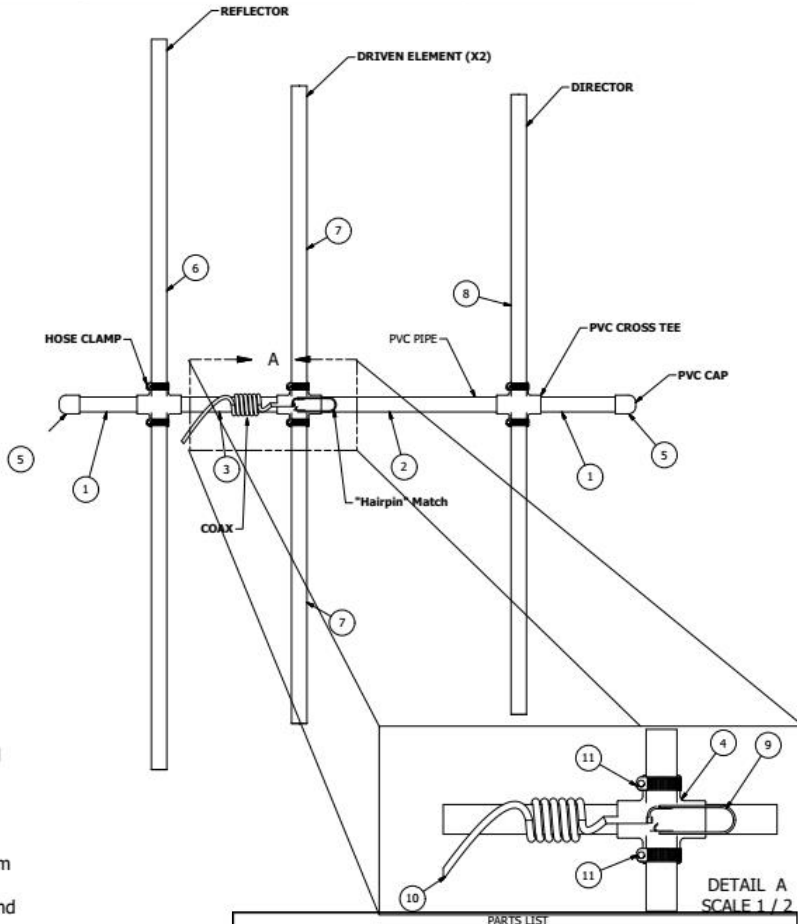
- PVC Cutter / Saw
- Marking device (Sharpie)
- Tin Snips (Aviation Snips) or Shear
- Soldering Iron
- Screwdriver (Flat Head)

## Cutting / Assembly Instructions

(Refer to Page 2 and 3)

1. Mark and Cut PVC Pipe to proper lengths
2. Deburr cut PVC pieces with sand paper
3. Using a flat hard surface, assemble PVC pipe, with caps and Cross Tees as shown on this print
4. (Optional) Un-assemble, prime and glue PVC back together.
5. Mark and cut tape measure using tin snips to the proper lengths as shown on blue print
6. On the 17.75" tapes, use sandpaper/dremel to remove plastic and painted coating about 3/8" in diameter to expose the bare metal.
7. Bend wire into "U" shape having approx .75" Gap
8. Assemble Yagi using the tape measure and clamps.
9. On the Driven Element, Solder Hairpin wire match
10. Strip Coax to expose about 3/16" of the center conductor, Make wire from braided shield
11. Solder the center conductor to the bare spot of one of the 17.75" tape and solder the shield to the other 17.75 tape.
12. Wind Coax 6 turns around the 1/2" PVC Pipe and secure with electrical tape

**ALL DONE!** Adjust SWR by adjusting the spacing between to the two 17.75 Tapes




PARTS LIST

| ITEM | QTY | PART NUMBER | DESCRIPTION |
|---|---|---|---|
| 1 | 2 | 5in-PVC-Pipe | 1/2" Sched 40 PVC Pipe - 5in |
| 2 | 1 | 11p5in-PVC-Pipe | 1/2" Sched 40 PVC Pipe - 11in |
| 3 | 1 | 7in-PVC-Pipe | 1/2" Sched 40 PVC Pipe - 7in |
| 4 | 3 | 4Way-PVC-Tee | PVC CROSS FITTING (1/2" PIPE) |
| 5 | 2 | Cap-PVC-End | 1/2" PVC End Cap (Non Threaded) |
| 6 | 1 | 41p3755-TapeMeasure | 41.375 (41-3/8)" Tape Measure |
| 7 | 2 | 17p75-TapeMeasure | 17.75 (17-3/4)" Tape Measure |
| 8 | 1 | 35p125-TapeMeasure | 35.125 (35-1/8)" Tape Measure |
| 9 | 1 | Hairpin | 5" of #12 or #14 AWG Soild Copper Wire |
| 10 | 1 | CoiledRG | X" RG-58A 50Ohm Coaxial Cable |
| 11 | 6 | Clamp | 7/8" - 1-1/4" Stainless Hose Clamp |

**Credit To:**
Joe Leggio (WB2HOL)
Andy Woolard (AA4XS)
Tom Niderost (K4TMN)

Prints By: Jeffrey Bail - NT1K Http://www.NT1K.com

# More Antenna Adventures

Kent Britain WA5VJB

## *Cheap Antennas for the AMSAT LEO's*

Hand held dual band antennas are popular for QSO's through many of the Low Earth Orbit (LEO) satellites. This article covers several 145 MHz antennas, a larger number of 435 MHz antennas, and how to combine them into one antenna.

Got a STRONG arm or plan to use it with a Tripod, then by all means the 4 Element 145 MHz and the 8 element 435 MHz can be used together. Or there is the 2 element 145 and 5 element 435 MHz used in the AMSAT demonstrations. It's is only 32 inches long. Something much lighter for backpacking? How about using a 20 inch long 2 elements on 145 MHz and a 3 elements on 435 MHz. For the 'Arrow' Enthusiasts, this smaller 2 elements on 145 MHz and 3 elements on 435 MHz will actually out perform the standard 'Arrow'.

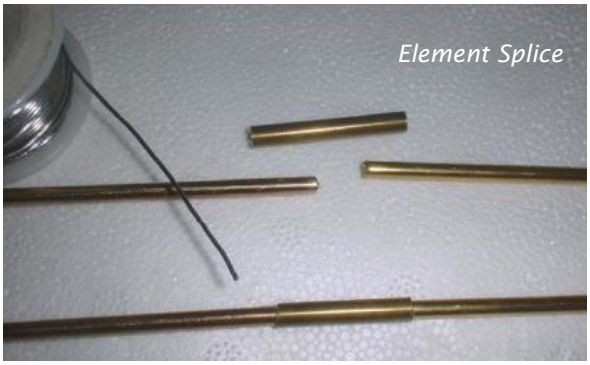
*Drew, KO4MA, using the Cheap LEO antenna during a Dayton AMSAT LEO Demonstration*

One popular commercial antenna mounts the elements 90 degrees to each other. This is a mechanical, not really an electrical, decision. On this antenna the elements can be mounted cross ways, but mounting them flat makes the antenna much easier to lay down in the back of the truck or store in the garage.

### *Construction*

For the boom 5/8 x 5/8" or ¾ x ¾" wood works well. If you plan to mount the antenna outside for a long term, a coat of spar varnish, spray enamel, or some of that water proofing stuff you use on wood decks will add years to the life of the antenna.

For the elements I used 1/8" material. The 435 MHz reflector and directors were from a roll of Radio Shack Aluminum Ground Rod wire. RS Stock number 15-035. 40 feet will run you about 5 bucks and make a lot of antenna elements. But #10 bare Copper wire, Bronze Welding Rod, and Hobby tubing have all been used. If you want to use 3/16" diameter elements, cut them 0.2 inches shorter than the dimensions in the tables to compensate for the thicker material. The 2 Meter elements were all made from Bronze or Brass welding rod. I like to use something I can solder the coax to and the Welding Rod solders well.



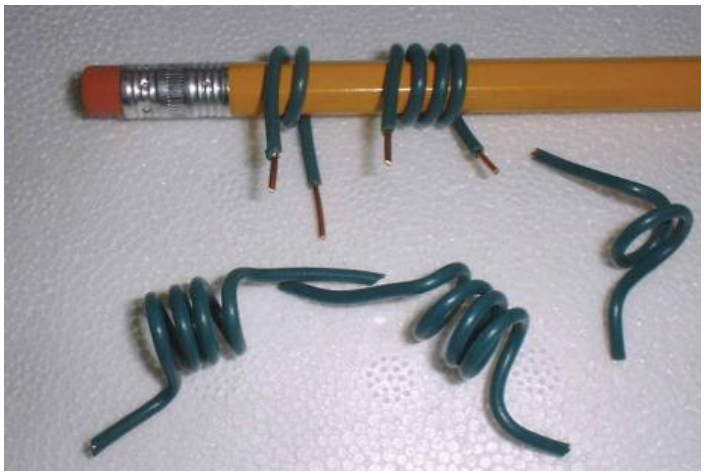
*Element Splice*

The Welding Rod is only 36" long. A section of 1/8" i.d. Copper or Brass hobby tubing makes a good splice. Just slip it on and solder them together. Save some of that hobby tubing. If you have a habit of "I trimmed the antenna twice, and it's still too short!", then you can solder a piece on the end of the driven element and start over.

I usually hold the elements in place on the boom with a drop of super glue. But Silicon glue and even paint have been used.

*Above: The 145/435 MHz Band Splitter*

*Below: Winding the Band Splitter Coils*



### *Splitter*

The band splitter is just a 250 MHz High Pass Filter and a 250 MHz Low Pass Filter connected together. This doesn't have to be very complex, or even very accurate. As long as the filters cut off somewhere between 200 and 400 MHz, they will work fine. So if the coils get squished, just bend them kind of back in shape, and go for it. This one is built cheap, just out in the air on a piece of PC Board. You can build the splitter into a box if you like, with connectors and all, but it's not going to change their performance. And this Band Splitter even makes a good project if you want to use two other 145/435 MHz antennas.

Remember, we are not trying to filter off harmonics, just make the 2 Meter energy go to the 2 Meter antenna, and the 435 MHz signals go to the 435 MHz antenna.

Parts list:

| Antenna Version | Capacitors | Coils | Wire & Turns |
|---|---|---|---|
| 435 MHz High Pass | 2 x 4.7 pF Caps | 1 Coil | 1-1/2 turns #18 or #20 wire on a Pencil |
| 145 MHz Low Pass | 1 x 10 pF Cap | 2 Coils | 3 turns #18 or #20 wire on a Pencil |

You're too late, I have already been asked if it needs to be a #2 or a #3 pencil.

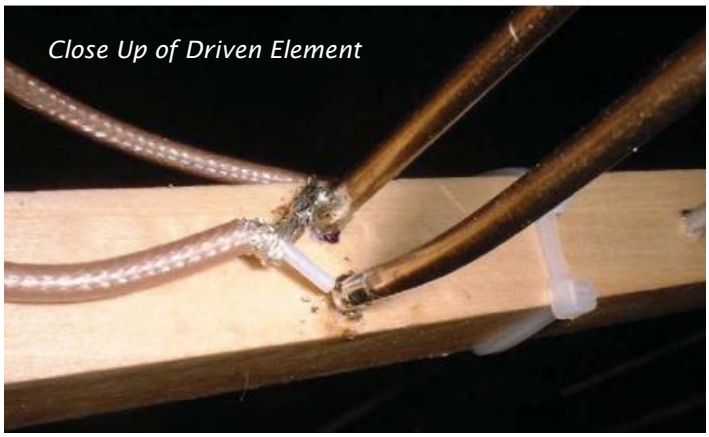
For the record I wound my coils on a Red grading pencil. For those of you with a more mature sense of humor, just about all wood pencils make a 0.3" coil form. We are frequency spitting the signals, not power dividing, so the length of the coax between the splitter and the antenna is not critical. You want to keep the coax as short a practical, but its exact length is not important. Got a box of 4.7 pF's? You can use 2 of them instead of the 10 pF. Be sure to keep those leads very short. I used Teflon coax on my splitter, it solders so much easier than foam RG-58, but you're free to build it in a box and use connectors if you like, but it's not really necessary.

### *Power Handling*

Power handling of this band splitter depends almost entirely on your caps. With 50 volt caps, 20 watts is about your limit. Dig up some 1 kV caps, and the coax will probably melt first as you warm up that 4CX250.

One of my first prototypes tried to use the last 2 Meter director as the 435 MHz reflector. An interesting idea to save weight and make the antenna shorter, but performance suffered too much. So all versions now have a reflector on the 435 MHz portion. The last 145 MHz director and the 435 MHz reflector will interact. If you plan to mount them in the same plane, what I find easiest, space them 3 inches apart.

These J driven elements usually bring several comments from people new to "Cheap Yagi's". The shield of the coax goes near the center of the top of the element. This is a voltage null and directly soldering the coax to the driven element has a lot of advantages. The tip of the coax goes to the tip of the J. So you can think of this


*Close Up of Driven Element*

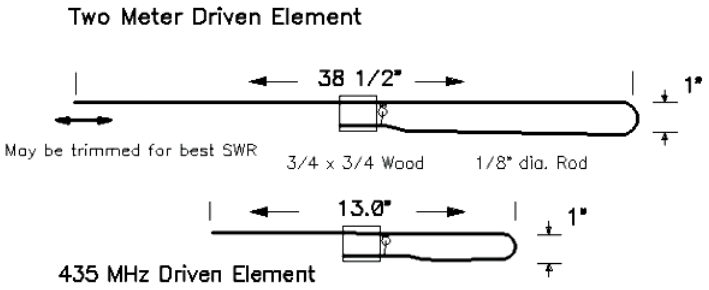



*Figure 1 Dimensions of the Driven Elements*

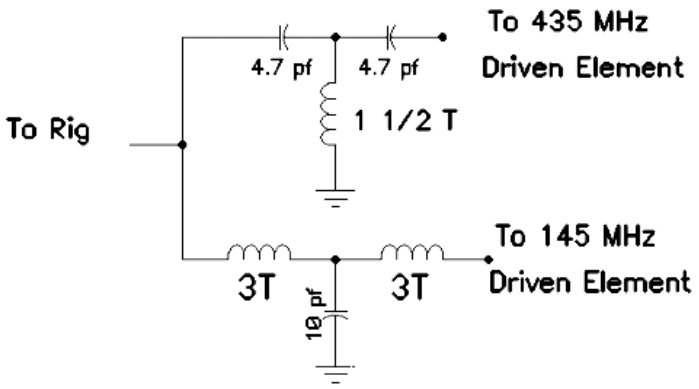
driven element as 3/4ths of a folded dipole or a gamma-match with no capacitor. In free space, the J driven element has about a 150 Ohm impedance. As other elements are added, they load down the impedance of the driven element. If the antenna has relatively wide element spacing, then a direct match to 75 Ohms is possible. Bring in the reflector and directors a little closer, then you have a direct match to 50 Ohms. So the impedance matching is the length and spacing of the other elements. Just build the antenna to the dimensions, solder on the coax, and start talking. No tuning required.

### *Tuning it up*

For the ultimate in performance connect a coax to just the 2 Meter portion and trim the free end of the J for best SWR for your favorite LEO uplink frequency. Then connect the coax to just the 435 MHz portion and again trim the free end of the element for best SWR. Now install the band splitter and this time tweak the coil spacing for best SWR at your spot frequencies. You have now gotten the last 0.1 dB out of the antenna.

For everyone else, just build the antenna to the dimensions and the SWR will be under 2 to 1 on both frequencies. Just build it and talk. The design is pretty Idiot Resistant. This antenna can be built in 30 combinations of elements and polarization's. One should fit your need. The 2 elements on 145 and 5 elements on 435 MHz version has done great in the field tests.

Now you can have fun with the LEO's for less than $10.




*Schematic of the Band Splitter*

| Element Dimensions -- **145 MHz Version** | | | | |
|---|---|---|---|---|
| | Ref | DE | D1 | D2 |
| 2 element | | | | |
| Length | 40.5 | ** | | |
| Spacing | 0.0 | 7.0 | | |
| 3 element | | | | |
| Length | 40.5 | ** | 36.5 | |
| Spacing | 0.0 | 8.5 | 19.75 | |
| 4 element | | | | |
| Length | 40.5 | ** | 37.0 | 32.5 |
| Spacing | 0.0 | 8.5 | 19.0 | 40.0 |

| Element Dimensions -- **435 MHz Version** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Ref | DE | D1 | D2 | D3 | D4 | D5 | D6 |
| 3 element | | | | | | | | |
| Length | 13.5 | ** | 12.2 | | | | | |
| Spacing | 0.0 | 2.5 | 5.5 | | | | | |
| 4 element | | | | | | | | |
| Length | 13.5 | ** | 12.4 | 11.5 | | | | |
| Spacing | 0.0 | 2.5 | 5.5 | 11.5 | | | | |
| 5 element | | | | | | | | |
| Length | 13.5 | ** | 12.5 | 12.25 | 11.75 | | | |
| Spacing | 0.0 | 2.5 | 5.25 | 12.0 | 18.5 | | | |
| 6 element | | | | | | | | |
| Length | 13.4 | ** | 12.4 | 12.0 | 12.0 | 11.0 | | |
| Spacing | 0.0 | 2.5 | 5.5 | 11.25 | 17.5 | 24.0 | | |
| 8 element | | | | | | | | |
| Length | 13.4 | ** | 12.4 | 12.0 | 12.0 | 12.0 | 12.0 | 11.1 |
| Spacing | 0.0 | 2.5 | 5.5 | 11.25 | 17.5 | 24.0 | 30.5 | 37.75 |

*Driven element Dimensions from Figure 1*
*Ref is the Reflector, DE is the Driven Element, and all spacings are measured from the Reflector element.*

# Tech Tips

Dan Richardson, K6MHE

## *A Better Way To Install PL-259 Connectors On RG-8X*

*When installing small coax such as RG-8X in a PL-259 using an reducer have you ever wondered if you were really going to get a good solid connection to the outer braid when you looked the holes in the PL-259 and saw only one or two flimsy little strands of the shield? Well, here is an unauthorized solution to that problem.*

Installing RG-58, 8X and their kin to PL-259 connectors can be a bit of a challenge. No matter how nice a book's assembly diagram (Figure 1) looks and how easy the installation instructions sound my results using those methods never seem to come out the same.

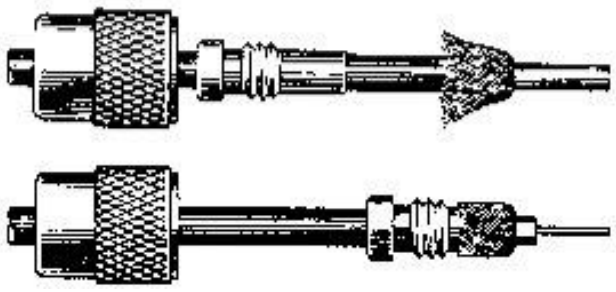


*Figure 1—A typical example illustrating how a reducer is to be installed. Looks easy enough doesn't it?*

The problem for me is getting the shield portion folded back over the reducer. The shield loses its form very quickly when folded back over the larger diameter of the reducer. I tried several approaches to solve this problem such as combing, trimming and arranging the braid very carefully, but when screwed into the PL-259 body the results many times are that only a few strands of shield is visible through the holes of the connector body to solder.

### *A Good Thing To Know*

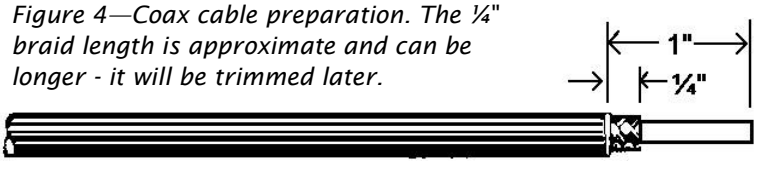
Several years ago I observed an amateur installing PL-259 connectors on RG-8X coax using a unique method that made me wonder why I hadn't thought of it myself. I have been using this procedure ever since obtaining good sound mechanical and electrical connections without ever experiencing a failure of any kind. A good thing should be passed along so here's how it's done.

To begin, let me state that I normally always use silver plated connectors and reducers. They are so much easier to solider to than the slightly less expensive nickel-plated connectors. However, if you are using a reducer that is not silver-plated you will need to tin the end of the reducer prior to installing the cable. To do this use a fine cut file or on a piece of fine emery paper to remove the plating on the end of the reducer (Figure 2) until you can see the bright brass exposed. Next using a large soldering iron tin the end of the reducer where the plating had been removed (Figure 3). Apply just a light flash of solider on this surface. Don't pile it on as it may run down the inside of the reducer and make a mess of things.

Prepare the cable by removing the outer jacket and shield as shown in (Figure 4). (Note: The ¼" dimension shown for the shield's length is approximate. It can be longer as it will be trimmed later during the installation.)

Slip the prepared cable into the reducer so that the end of the outer jacket is even with the reducer's end. Next, fold the braid over the end of

*Figure 4—Coax cable preparation. The ¼" braid length is approximate and can be longer - it will be trimmed later.*



the reducer so that the strands are at a right angle (90°) or more (Figure 5).

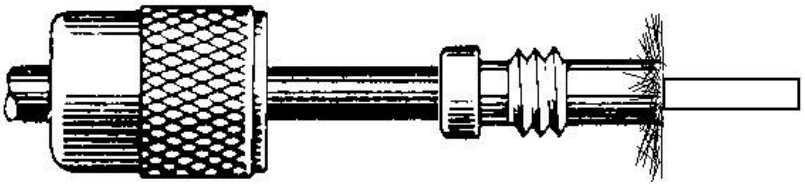


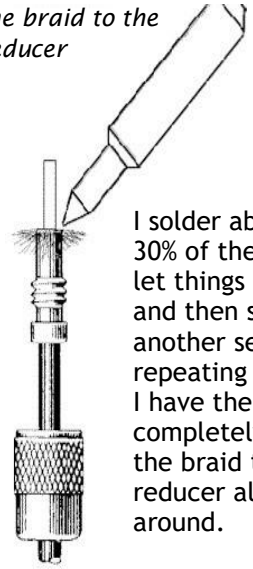
*Figure 5 - Folding the shield braid strands over the end of the reducer.*

***An Aside:***

Note it is very important when soldering connectors onto coaxial cables to use a LARGE SOLDERING IRON - at least 100 -150 watts or better. If you use a small pencil type soldering iron or a soldering gun - even a high wattage type - there simply is not enough mass in the soldering tip to do the job correctly. The idea is to make the solder joint as fast as possible and get away from the connector quickly before the whole thing gets too hot and ruins the cable. You should not allow the soldering iron contact with the connector for more than 2-4 seconds. If your soldering iron is of sufficient size the short time will not be a problem. If you can not get the solder to flow in that length of time then that's an indication that the iron is not big enough for the job.

At this point I place the coax/ reducer assembly into a small tabletop vise so that they are held firmly in a vertical position. Carefully place the tip of soldering iron on the braid (Figure 6). Be careful that you do not allow the tip of the soldering iron to touch and damage the cable's plastic dielectric. The trick is to keep the tip of the soldering iron about 1/8" away from the dielectric and let the solder wick up the braid and fuse to the reducer. Don't pile the solder on. It takes very little solder to make a sound connection. Also, don't try to solder the entire surface at once.

*Figure 6– Soldering the braid to the reducer*



I solder about 20-30% of the area, let things cool a bit and then solder another section repeating this until I have the completely bonded the braid to the reducer all the way around.

Allow the assembly to cool and then inspect the dielectric to be sure there isn't any visible damage. If you see that you have accidentally melted or damaged the dielectric just stop at that point; remove the reducer and start over. Using a sharp flush-cutting diagonal cutter (or heavy-duty cuticle scissors) cut off the remaining excess braid around the reducer (Figure 7).

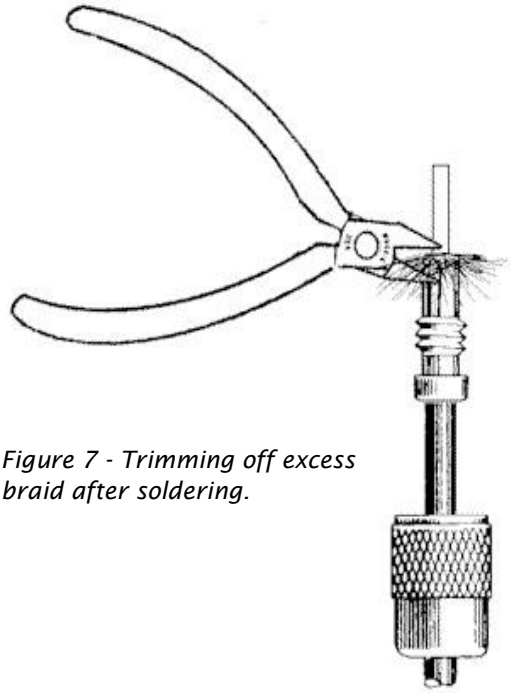


*Figure 7 - Trimming off excess braid after soldering.*

After removing the excess braid I use a small fine cut file to do a final touch-up removing any jagged rough spots.

Next cut and remove the dielectric insulation leaving a portion that extends about 1/32" to 1/16" beyond the end of the reducer as shown in Figure 8.

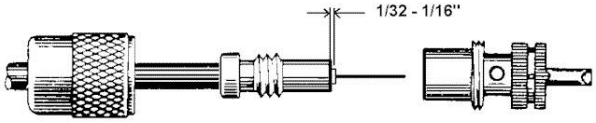



*Figure 8 - Coax and reducer ready for final assembly.*

If the coax has a stranded center conductor it should be tinned at this time. Screw the reducer and cable assembly into the PL-259 and tighten well.

Continue by soldering the center conductor to the PL-259's pin in the conventional manner, trimming off the excess conductor and cleaning any flux residue from the pin.

Finally, solder one of the holes in the connector body to assure that the reducer will stay put. I have found that without this important last step, in time, the reducer will loosen.

### *Conclusion*

Using this technique I have no doubt that I have a good electrical and mechanical connection as 100% of the braid is now soldered and bonded rather that just a few strands.

There is concern by some that soldering the braid to the reducer in this manner may damage the cable. While that possibility exists, this method allows you to visually inspect the dielectric for any possible damage prior to installing the reducer/coax assembly into the connector body - something you can't do using the conventional method. I have been using this method for a number of years and I have never had a problem or failure.

Professional installers who have access to specialized tools such as industrial resistance-soldering stations may have better methods utilizing those tools, but for the average Joe Ham (me) who is using a knife, diagonal cutters and soldering iron (of the proper size) this procedure works very well. Try it yourself and see what you think.

## *Some References For Satellite Newbies*

### *With Just a Baofeng UV-5R Handheld!*

These videos demonstrate requirements needed to communicate via Amateur Radio Satellites using an inexpensive Baofeng UV-5R Dual Band Radio

https://goo.gl/EsaF23

Tuning into low earth orbit satellite SO-50 on 436.795 FM on January 9 2014
https://goo.gl/z46GYX

and https://goo.gl/xR84tX

Another first attempt to receive audio from amateur radio satellite (AO-91) launched from Vandenberg Air Force Base in California on November 18th 2017. Equipment used to receive the satellite was a Wouxun KG-UV3D with a longer dual band antenna.

https://goo.gl/YaaJDk

### *The Foundation Guide to Amateur Satellites*

Working AO-91A two-part video demonstration. Peter Parker, VK3YE, has published two excellent introductions to amateur satellites videos. Peter describes his two-part video demonstration as, "A new amateur satellite has just gone up and it's super easy to work. You just need a pair of handhelds on 2m & 70cm FM.

https://goo.gl/ZiXeJZ Part One

https://goo.gl/i6u6nn Part Two

Watch this video to find out how to make contacts through AO-91 with equipment you probably already have.

And remember, you can have fun just listening to these satellites as a way to get started.

### *Programming Satellite Frequencies*

Of course, if you're going to use that UV-5R (or any other transceiver) for satellites you had better program in some frequencies. Here is a video guide to do just that:

https://goo.gl/MvcLuh

And finally two videos that sum it all up:
https://goo.gl/F3v4Pw and https://goo.gl/famjC3

# Tech Topics

Daniel Romila VE7LCG

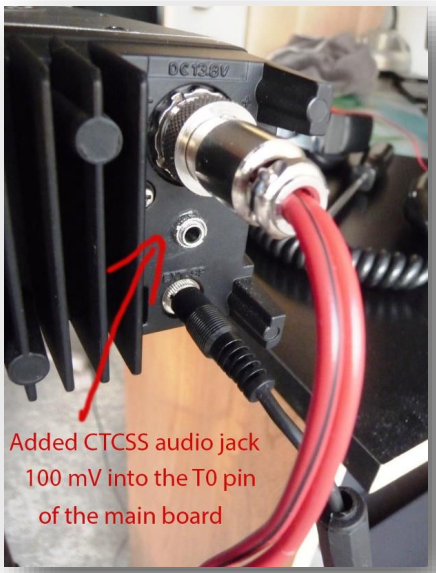
## *A PL Tone Solution For Older Transceivers*

*The experiment: Reuse of old transceivers that do not have Pl tones with repeaters that require PL tones.*

*The Problem: Use old transceivers, which do not know PL tones, with the modern repeaters, that require PL tones.*

### *Solutions*

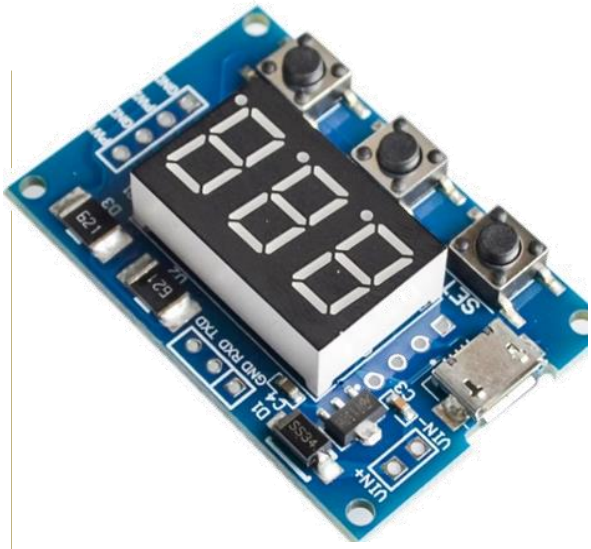
- Use an external computer, with a free audio application, connected at the audio INPUT. This is how I use in this moment my old Kenwood 7900, a 34 years old 2 meter transceiver.




(It also work with a cellphone on which it is installed a free audio generator application. It even works without electrical connection; just have the cellphone put at high volume generating the PL tone in front of your microphone, when you transmit and talk! I personally tried that).

- Use an external PL tone board. There are boards costing $100 CAD, and boards costing $2.25 CAD, including shipping and taxes: https://goo.gl/eM1GnV

Those costing $2.25 CAD have a 3 digit display, so it will generate and display only 103 Hz instead of the required 103.5 Hz, for example. The wave is squared, but it is FM and it becomes somehow rounded in the audio chain, which does not keep the rectangle shape because it is all analog.

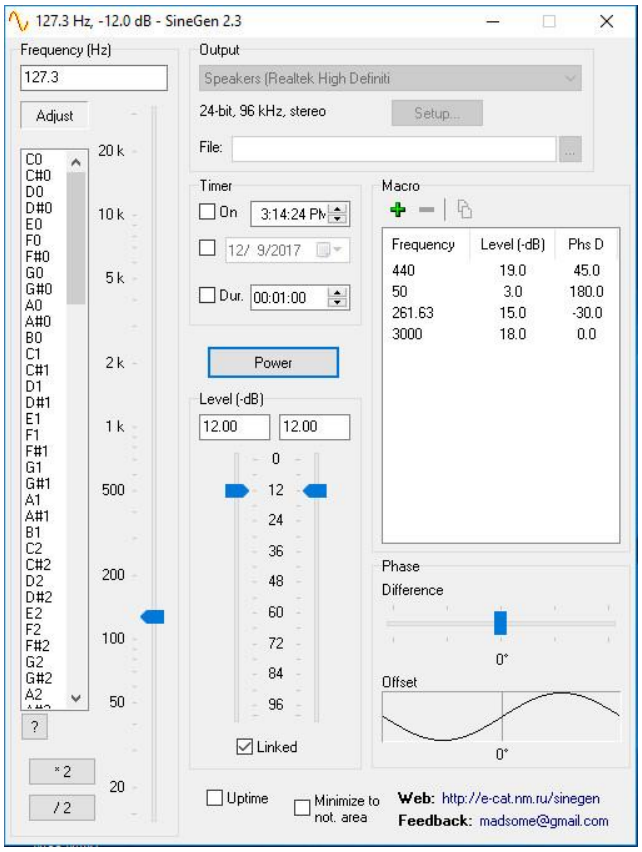


### *Experiment*

Is a decimal precision really necessary, or is it that the decimal just comes from dividing a single crystal frequency oscillator, and that the results are that some PL tones are round numbers, and others just happen to have a decimal?

### *Experimental Method*

I used the Kenwood 7900 2 meter transceiver and I connected to various repeaters that require a PL tone. I introduced an audio signal from a desktop PC, generated by the free application SineGen. I could vary the frequency and the level of the PL tone supplied to the Kenwood 7900 transceiver. I kept the signal level stable at the nominal PL required tone, and exactly the same level, not more, going a little up and down the PL nominal value.




*For an explanation of how PL tones work to reduce interference between users, check out the video at: https://www.youtube.com/watch?v=DAQYfpETDdM*

### *Experiment Results*

K7SKW repeater, at 57.5 km, tone 103.5 Hz. It works with a tone between 102 and 105 Hz

VE7SER repeater, at 93 km, tone 167.9 Hz. It works with a tone between 167 and 169 Hz

VE7RFR repeater, at 94 km, tone 100 Hz. It works with a tone between 98 and 102 Hz.

VE7VIC repeater, at 106 km, tone 100 Hz. It works with a tone between 98 and 102 Hz

My thanks to VE7GLT from Victoria who helped me try the VE7VIC repeater.

### *Conclusion*

A $2.25 CAD tone board looks OK for the purpose, and it is worth trying. I bought it and I await its delivery.

*~ Daniel Romila VE7LCG*

# What Is Doppler Shift?

### *Doppler Shift in Satellite Tracking*

As a satellite approaches, the frequency appears raised relative to the actual transmission frequency. As it goes away, the frequency appears to be lowered. At the time of closest approach, the transmitted and received frequencies are usually the same. The rate of change starts off slow, is greatest at the time of closest approach and then tails off towards the end of the transit. This is because of the rate of change in the satellite's velocity along a line joining the satellite to the receiver. When tracking a satellite via radio, program a number of transmit frequencies in memory channels 5KHz apart and switch channels as the satellite passes for clearest reception. And, like earth bound repeaters, some satellites need a tone to turn them on. The receive frequency can remain the same. There is a YouTube video about programming the Baofeng UV-5R for satellites: https://goo.gl/MvcLuh

## SARC CLUB EXECUTIVE 2017-2018

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# QRT

Robert Fishwick VA7FMR

## *A Successful Attempt At CW*

*Robert has been experimenting with CW. He readily admits that his CW is not up to par and that decoding and sending manually is, as yet, out of the question. He has configured readily available software to decode and send CW from his computer keyboard. He recently shared this experience with a promise to expand with a future Communicator article and perhaps a meeting talk and demo. —Ed.*

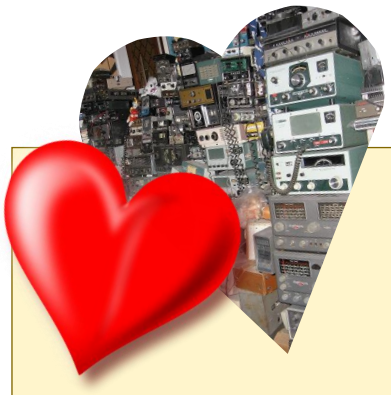
After a recent Kalmar breakfast visit on Saturday I returned home in order to set up for the CQWWCW contest to see if I could work QSO's in the contest. I started N1MM+ and configured the file for the contest and then started FLDIGI in CW read mode. This displays a box on the screen in which CW is decoded and a water fall showing 3 KHz of the spectrum. The waterfall has numbers from 0 to 3000 above the width of the waterfall, numbering the 3KHz bandwidth of the display. I had installed my 20 meter whip dipole antenna on the patio the day before. I was delighted to see 6 or 7 CW signals moving down the waterfall. There is a cursor in the waterfall area and I could click and hold and move the cursor over the strongest signals and hear the code dots and dashes, but only the strongest signals decoded enough data for me to read a call sign and the other important info.

I chose the strongest signal that decoded his entire CQ Call sign and then clicked the "My Call sign" box in N1MM+ and my transmitter put out my call sign twice, I checked for power output and just about all of my 100 watts was going out to the antenna. No call back. It was just as though he did not hear me. I tried for hours moving the cursor from strong signal to strong signal to no avail. I tuned the transceiver from 14 MHz up to 14.100 and as more and more stations travelled down the waterfall I tried to make calls again to no avail. I quit for supper and watched some TV but my mind kept going back to my radio. So I went back and tried until 11 and went to bed very disappointed.

I tried for about a half hour on Sunday, just before supper, no call backs. I watched TV but my mind kept going back to my miserable failure. At about 10:00 in the evening I went back in for another very late try. I got my radio on and started N1MM+ and looked at the band map on the right and checked that the frequency of the band map matched the radio's display and started to move the cursor over the waterfall choosing the strongest displays in the waterfall, when I suddenly got a big exploding thought. The band map of N1MM+ changes the frequency of my radio through the cat control but does the cursor in the waterfall display change my radio? After checking, the answer was a big NO. I looked over at the Band Map and it was filling up with call signs so I clicked on one and my radio tuned to that frequency but which one of the 8 or 9 columns in the water fall was that call sign????

I started at the right and clicked the curser and placed it over one of the signals, wrong call sign, next, wrong call sign, next etc. etc. etc., until, almost at the far left I found the same call sign. The green Squelch column went up like crazy, breath held, I waited for him to complete his CQ call and hit my call sign button in N1MM+ and he came back. We completed the QSO and thanked each other, and I started to tune my radio, bringing the signals to the cursor. I never touched the cursor again, I tuned in the signal to the cursor and logged 21 confirmed QSO's in the next 40 minutes until the contest ended. Japan, Canada both local and Eastern, East coast USA, Florida, Texas, New Mexico, Washington and California states and Hawaii. My biggy was Scotland in the UK, although Japan is further.

*~ Robert VA7FMR*



## *It's February*

The next Surrey Amateur Radio Club meeting is on Wednesday, February 14 at the EM BC SW PREOC, 14292 Green Timbers Way, Surrey, BC at 7pm. It's Valentine's Day, so bring your sweetheart and treat them when we follow-up at McDonald's after the meeting.

The program will feature a popular returning guest, Adam Farson VA7OJ/AB4OJ, a retired communications engineer, who will speak about his testing and evaluation of the iCom IC-7610. Adam Field tests new transceivers for iCom and is very knowledgeable about their products. This is one of the transceivers we have selected for the Operations & Training Centre.

**SARC** hosts an Amateur Radio net each Tuesday evening at 8 PM. Please tune in to the VE7RSC repeater at 147.360 MHz (+600 KHz) Tone=110.9, also accessible on IRLP node 1736 and Echolink node 496228.

On UHF we operate a repeater on 443.775MHz (+5Mhz) Tone=110.9 or IRLP Node 1737.

| | SARC Net 20:00 Hrs |
|---|---|
| 1st Tuesday Standby | Drew VA7DRW<br>Dixie VA7DIX |
| 2nd Tuesday Standby | Jinty VA7JMR<br>Sheldon VA7XNL |
| 3rd Tuesday Standby | Rob VE7CZV<br>Vacant |
| 4th Tuesday Standby | Kapila VE7KGK<br>John VA7XB |
| 5th Tuesday Standby | Robert VA7FMR<br>Vacant |
| Want a turn at Net Control? Contact the SARC Net Manager | |

## Down The Log…

### SARC Monthly Meetings

2nd Wed. (Sept-Jun)
1900 hr at the PREOC
Emergency Mgmt BC
14292 Green Timbers
Way, Surrey, BC

### Weekly Club Breakfast

Saturday between 0800 and 1000 hrs at the Kalmar Family Restaurant 8076 King George Blvd. Surrey

### SARC Net

Tuesday at 2000 hr local on 147.360 MHz (+) Tone=110.9

### SEPARS Net

Tuesday at 1930 hr local on 147.360 MHz (+) Tone=110.9

### VE7RSC Repeaters

2m: 147.360MHz+
Tone= 110.9Hz
IRLP node 1736
Echolink node 496228

1.2m: 223.960 Mhz -1.6
Tone=110.9

70cm: 443.775MHz+
Tone= 110.9Hz
IRLP node 1737

## We Have A SARC Patch!

These are suitable for sewing on a jacket, cap or your jammies, so you can proudly display your support for the club.

The price is $4 each or three for $10 and they can be picked up at a meeting or the weekly Koffee Klatch.



*We thank our sponsors for their SARC support.*

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These folks did a great job on the hydraulics for our antenna trailer.